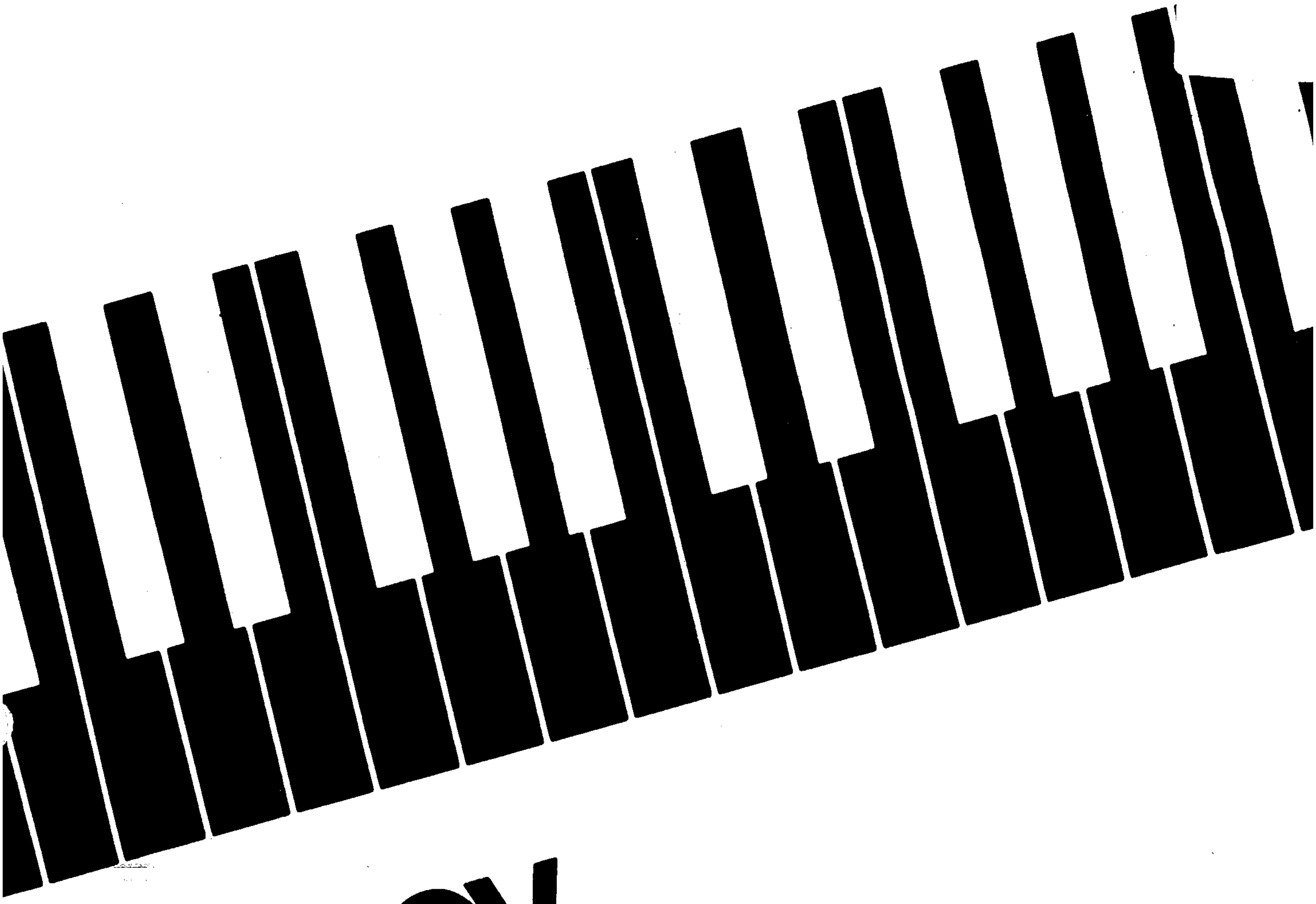
MODEL C300 SERVICE MANUAL



Lowrey organs

PROMENADE

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SERVICE MANUAL

MODEL C300

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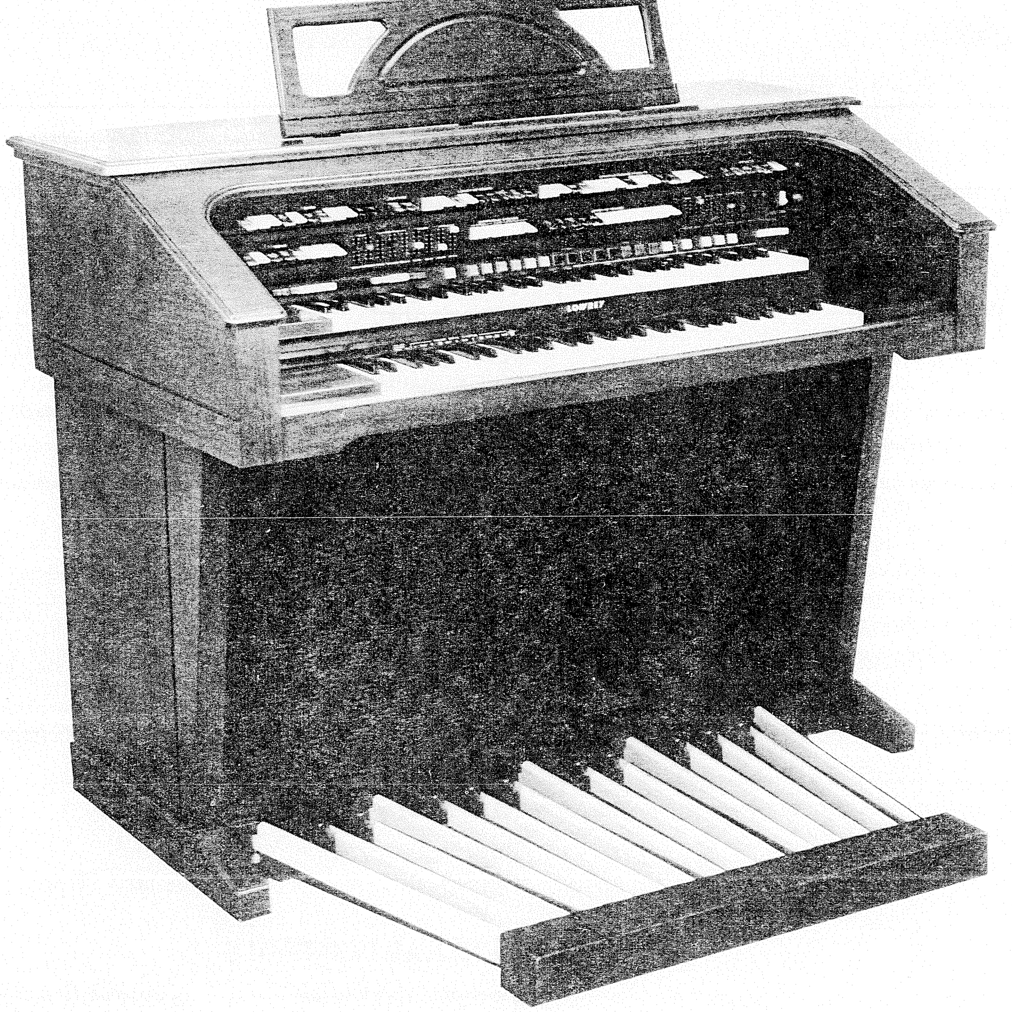
SPECIFICATIONS



C300 FEATURES AND SPECIFICATIONS

Completely solid-state, self-contained, four-channel console organ with two 61-note keyboards and 25-note pedal board. The organ includes four amplifiers, six speakers and four separate speaker channels.

2 - 61-note keyboards
1 - 25-note pedal keyboard
4 - Amplifiers — Main-Leslie-Phase 2-Phase 3

2 - 12-inch Bass Speakers
2 - 6x9-inch Chorus Speakers
1 - 10-inch Leslie Speaker
1 - 8-inch Main Speaker

BASS

Pedals

Pedal Sustain
Pedal 16
Pedal 8
Orch. to Pedal
Diaphone 16
Pedal Wow
Pedal Guitar Bass

Keyboard

Genie String Bass
Genie Guitar Bass

BASS VOLUME

Full
Medium

GENIE

Magic Genie Chords
Chord Hold
Guitar Strum
Ukulele Strum
Strum Downbeat
Piano Arpeggio
Harpsichord Arpeggio
Golden Harp
Boogie Woogie Bass

SYMPHONIC STRINGS

Upper

Cello 16
Viola 8
Violina 4

Lower

Viola 8
Violina 4

SPECIFICATIONS

LOWER KEYBOARD

Piano
Guitar
Banjo
Ukulele
Genie Plus Organ
Vox Humana 8
Flute 8
Flute 4
Orch. to Lower

CHORUS

Flute Chorus/Celeste
Leslie Tremolo

PRESETS

Vibes
Vibra Harp
Hawaiian Guitar
Piano
Electric Piano
Harpsichord
Symphonic Wow
Mandolin
Banjo
Orchestral Clarinet
Accordion
Piccolo
Violin
Harmonic 4
Harmonic 2-2/3

UPPER KEYBOARD

Trombone 16
Trumpet 16
English Horn 8
Kinura 8
Vox Celeste 4
Flute 16
Flute 8
Flute 5-1/3
Flute 4
Flute 2-2/3
Flute 2
Flute 1

RHYTHM

Rhythm Start Auto
Rhythm Start

EFFECTS

Sustain
Repeat Percuss
Percuss Long
Wow Attack Slow
Vibrato
AOC

GOLDEN HARP

Up
Down
Up/Down 2
Up/Down 3
Virtuoso
Rhythm Syncopation

FLUTE PRESETS

Flute No. 1
Flute No. 2
Flute No. 3

ORCHESTRAL SYMPHONIZER

Grand Piano
Honky Tonk
Harpsichord
Clavecin
Classic Guitar
Electric Guitar
French Horn
Carillon
Trombone
Post Horn
Trumpet
Trumpet Mute
Saxophone
Krumet Horn
Oboe
Cancel Upper

GENIE SYMPHONIC RHYTHM

Samba
Bosa Nova
Rhumba
Latin Rock
Rock I
Rock II
Rock III
Swing
Dixie
Shuffle
Country
Swing March
March Polka
Swing Waltz
Waltz
Metronome
Snare Cancel
Rhythm Intro

RHYTHM

Bass Drum
Cymbal
Brush
Snare Drum

GENERAL CONTROLS

Orchestral Volume
Harp Speed
Reverb Length
Wow Range
Repeat Speed
Vibrato Depth
Vibrato Speed
Sustain Length
Genie Strum Volume
Genie Arpeggio Volume
Genie Volume
Lower/Flute Volume
Rhythm Speed
Rhythm Balance
Rhythm Volume
String/Vox Lower Volume
String/Upper Volume

GENERAL FEATURES

48 - Major, Minor Seventh and Minor Seventh Chords
Expression Pedal
Golden Harp/Minor Chord Footswitch
Piano Sustain/Glide Footswitch
Master Volume Control on Amplifier
Minimum Volume Control on Amplifier
Auxiliary Input Jack
Tone Cabinet/Cassette Accessory Socket on Amplifier

CIRCUIT DESCRIPTION

SCHEMATIC 1

VIBRATO TONE GENERATORS & DIVIDERS

The tone generators consist of the Master Oscillator Q8, the Top Octave Synthesizers IC2, IC3 and the IC Dividers IC4-IC15. The Master Oscillator creates a 2 MHz signal which is applied to the Top Octave Synthesizers IC2 and IC3. Here the signal is divided to create 13 specific octave frequencies which are applied to the IC Dividers where they are divided in half several times, creating lower octave frequencies. These audio signals are then routed to various diode and audio keying circuits. The Vibrato Oscillator shifts the frequency of the Master Oscillator to create the vibrato effect.

IC1A&B, Q2 VIBRATO DELAY TRIGGER, INVERTER & SWITCHER

Turning on Upper Keyboard preset voices, Vibra Harp, Piccolo, Violin, Orchestral Clarinet or an Orchestral Symphonizer voice, enables IC1A by applying a positive voltage to Pin 2 of IC1A. Pressing an Upper Keyboard keyswitch, applies a positive voltage pulse to Pin 1 of IC1A causing its output to go low which develops a pulse across the .33 uf capacitor. This lowers the voltage on Inverter IC1B causing its output to go high which turns on Q2, momentarily grounding the vibrato oscillator creating the delayed vibrato effect. Pin 1 of IC1A is held high through the 22K resistor for the duration of the pulse across the .33 uf capacitor. Q2 is also switched on to cancel vibrato under the following conditions:

1. Turning on the Carillon preset; 2. With an Orchestral Symphonizer Piano preset* on, and 3. Pressing the Glide switch.

* Orchestral Symphonizer Piano preset refers to Grand Piano, Honky Tonk, Harpsichord and Clavecin voices.

Q1 ORCHESTRAL TO LOWER VIBRATO DELAY CANCELLER

With the Orchestral to Lower preset on, a positive voltage is applied to the base of Q1 turning it on. This prevents the enabling of IC1A from the Orchestral Symphonizer, cancelling the Vibrato delay effect on the Orchestral Symphonizer voices when they are played from the Lower Keyboard.

Q3, Q4 VIBRATO OSCILLATOR

The Vibrato Oscillator develops a continual low frequency (6.3 Hz) sine wave of sufficient amplitude to shift the frequency of the Master Oscillator high and low creating a vibrato effect. The oscillator output is applied to the Master Oscillator and the CFG Master Oscillator Q287 via the vibrato tabswitch. It is also applied directly to the Tremolo Drivers Q53 & Q54.

Note: When the Vibrato tabswitch is turned on, the Vibrato Oscillator output bypasses the preset Vibrato circuit and the speed and depth of vibrato are controlled by the Vibrato Controls VR2 & VR3.

Q6 & Q7 VIBRATO ENABLERS & PRESET VIBRATO DEPTH CONTROL

The Hawaiian Guitar, Violin, Piccolo & Orchestral Clarinet voices have a preset vibrato with the Vibrato tab off. Turning on any of these tabs applies a positive voltage to the base of Q6. This turns off Q7 and allows the vibrato signal to pass to the Master Oscillator Q8. The depth of vibrato or the amplitude of the vibrato signal for each voice is controlled by changing the value of resistance to ground at Point G. The cathode of Diode D10 will be considered a ground for the purpose of description, although it is actually slightly negative. Turning on the Hawaiian Guitar tab applies a positive voltage through Diodes D4 & D6, this reverse biases Diodes D5 & D7 causing the amplitude of the vibrato signal to be controlled by the 5.6K resistor to ground. With the Violin or Piccolo tab on, a positive voltage is applied only to the cathode of Diode D7, the path through D5 is forward biased paralleling the 5.6K resistor with the 3.3K resistor, thus reducing the amplitude of the vibrato signal for these voices. Turning on the Orchestral Clarinet leaves both D5 & D7 in a forward biased state - the vibrato signal now 'sees' the parallel combination of a 3.3K, 5.6K & 1K resistor which further reduces the vibrato depth for this voice.

Q5 GLIDE SWITCHER

Pressing the glide switch with the Orchestral Symphonizer Piano Presets* off, applies positive voltage to the base of Q5 turning it on. This detunes the Master Oscillator by one semi-tone and creates the glide effect.

* Orchestral Symphonizer Piano preset refers to Grand Piano, Honky Tonk, Harpsichord and Clavecin voices.

Q8 MASTER OSCILLATOR

The Master Oscillator Q8 develops a continual 2 MHz signal which is applied to the Top Octave Synthesizers IC2 and IC3, via the Buffers Q9 and Q10.

Q9, Q10 BUFFERS

The buffers act as an isolation stage between the Master Oscillator and the TOS, preventing any change in Master Oscillator frequency due to change in circuit load.

CIRCUIT DESCRIPTION

IC2, IC3 TOP OCTAVE SYNTHESIZERS
IC4-IC15 DIVIDERS

High frequency audio signal is applied to IC2 and IC3 where it is divided simultaneously to produce thirteen specific audio frequency signals. These signals are connected via buffers to upper and lower keyboard keying circuits, and also to IC Dividers IC4-IC15, where they are divided in half several times to produce lower organ tones. The signal outputs are of a particular octave frequency and are shown boxed on Schematic 1. (The letter-number designation within these boxes refer to a specific octave frequency and should not be confused with a keyboard designation.) Buffer transistors provide decoupling between the IC Dividers and diode keying circuits.

SCHEMATIC 2

UPPER KEYBOARD KEYING & CONTROL

UPPER KEYBOARD DIODE KEYING

Pressing an upper keyboard keyswitch applies positive voltage via the Cancel Upper circuit to the upper keyboard diode keying circuits. This positive voltage is applied to the anodes of D59 through D63, turning them on and allowing audio signal from the tone generators to pass to their respective diode keying groups. The 68K resistors for each footage are tied together in groups at their output and form the Diode Keying Groups. The positive voltage from each keyswitch also charges a 40 uf sustain capacitor which discharges upon releasing a key and holds diodes D59-63 on. The discharge rate of this capacitor is controlled by the sustain length regulators.

IC18A, IC18B UPPER KEYBOARD KEYDOWN DETECTOR

Pressing an upper keyboard keyswitch applies audio signal from the 5-1/3 and 2-2/3 Keydown Collector Line to Pin 6 of IC18A. IC18A amplifies and inverts the audio signal. D45 and D46 rectify the audio signal into a negative DC voltage. IC18B amplifies and inverts the voltage into a positive voltage which provides the keydown voltage for several circuits.

SUSTAIN LENGTH REGULATORS

Sustain for the Upper Keyboard voices is controlled by regulating the discharge rate of the 40 uf capacitor connected to each keying circuit. This capacitor is charged when holding a keyswitch down; upon releasing the keyswitch the capacitor discharges to the potential on the sustain control line. The remaining charge, if any, is then applied to the anodes of Diodes D59-63 holding them on, allowing audio signal to continue to pass for the duration of discharge time. The discharge time is controlled by Q36 & Q37 as follows: Positive voltage is applied to the base of Q37 by turning on a voice with a preset sustain, or if the sustain upper tab is on, from the Sustain Control VR5. The amplitude of Q37's base voltage is reflected by its emitter and provides the discharge reference for the 40 uf sustain capacitor. The higher the emitter voltage the longer the sustain. Under a no-sustain condition, the base of Q37 is held low causing it to turn on. This applies a positive voltage to the base of Q36, turning it on which holds the sustain line at -4V. Upon releasing a key, any charge on the 40 uf sustain capacitor discharges instantly to -4V. A no-sustain effect is created.

SUSTAIN CANCEL

IC1C, IC1D & Q38 SUSTAIN CANCEL TRIGGER & SWITCHER

Turning on any voice with a diode connected to the sustain cancel enable line applies a positive voltage via Q104 Upper R/S Canceller to Pin 9 of IC1C. This enables gate IC1C, allowing it to operate when an upper keyboard keyswitch is pressed. Pressing an upper keyboard key applies a positive pulse to Pin 10 of IC1C, causing its output at Pin 8 to go low. This develops a pulse across the .039 capacitor which pulls the input of Inverter IC1D low. The output of IC1D now switches high and turns on Switcher Q38, grounding the base of Q37. This turns on Q36 through Q37 and switches the sustain line to -4V causing any 40 uf capacitor that had been charged by a previously played note to instantly discharge. This creates a one-note or monophonic sustain effect. Also, when the output of IC1D switches high, it holds Pin 10 of IC1C high for the duration of the pulse across the .039 capacitor.

SLOW ATTACK DRIVE

Q46 SLOW ATTACK MODULATOR DRIVER

Turning on any voice with a diode connected to the slow attack enable line applies a positive voltage to the Collector of Q46, allowing it to operate when an upper keyboard keyswitch is pressed. Pressing an upper keyboard key applies a positive voltage through a 2.2M resistor and charges a .068 capacitor. The RC time constant of this capacitor and resistor cause a slowly rising voltage to be applied to the base of Q46. This turns on Q46, applying a steadily rising voltage to Pin 5 of IC62 gating the signal through IC62, producing the slow attack effect.

Q44 SLOW ATTACK DISABLE, PERCUSSION ENABLE SWITCHER

Turning on any upper keyboard percussion voice - Mandolin, Banjo, etc.- applies a positive voltage via the Slow Attack Disable and Percussion Enable Line to the base of Q44, turning it on. When Q44 turns on, it grounds the slow attack keying voltage and disables the Slow Attack Drive circuit. Note that the percussion effect will always override the slow attack effect.

PERCUSSION DRIVE

Turning on any of the following upper keyboard tabs - Mandolin, Banjo, Vibes, Harmonic 4 or Harmonic 2-2/3 - applies a positive voltage via the Slow Attack Disable and Percussion Enable Line to the Percussion Drive circuitry. This enables the percussion drive circuitry allowing it to operate when an upper keyboard keyswitch is played. The following description assumes one of the above-mentioned tabs is on.

NON-REPEAT PERCUSSION DRIVE

Pressing an upper keyboard key momentarily lowers the voltage on the base of Q41, turning it off. When Q41 turns off, a positive voltage pulse is applied to the base of Q42 turning it on, momentarily lowering the voltage on Pin 3 of IC21A. Pin 4 of IC21A switches high applying positive voltage to Q45. Q45 turns on applying positive voltage to Pin 5 of IC62 gating the signal through the Percussion Modulator. The decay time of the percussion pulse is dependent on the discharge time of the .18 uf capacitor at the base of Q45. The discharge path for this capacitor is through Diode D71 and is varied by turning on the Repeat Percuss or Percuss Long tabswitches.

REPEAT PERCUSSION DRIVE

With the Repeat Percussion tab in the on position, the Repeat Oscillator IC21A continuously oscillates. When an upper keyboard key is pressed, the output Pin 4 of IC21A is reset high. This high is applied via contacts of the Repeat Percussion tab and D68 to Pin 3 of IC21A. The 100K resistor and .27 uf capacitor form a time constant. Once the positive voltage at Pin 3 exceeds the high level threshold, Pin 4 switches low. The .27 uf capacitor discharges through D67 and the Repeat Speed Control. When the .27 uf capacitor has discharged below the low level threshold, Pin 4 switches high causing the sequence to repeat itself. The positive pulses applied to Q45 are routed to Pin 5 of IC62 gating the signal through the Percussion Modulator at the speed of the Repeat Oscillator.

WOW DRIVE

Normally the output Pin 10 of IC19A is high. When a positive pulse from the upper keyboard Keydown Detector IC18B occurs, the output of IC19A goes low, which switches the output of IC19B high.

The feedback between IC19A and IC19B makes them a Set/Reset Flip-Flop. At the same time the pulse from IC18B causes the Keydown Reset Q34 to discharge the .22 timing capacitor at the collector of Q35. The timing capacitor then charges through the Ramp Driver Q35 (giving a linear ramp). As the voltage on the capacitor increases, the output Pin 7 of IC20A follows it. When the output of IC20A is .6V higher than the voltage setting of the Range Control VR23 the output Pin 1 of IC20B (normally low) goes high, resetting the Set/Reset Flip/Flop causing the output of IC19B to go low. When IC19B goes low, the timing capacitor discharges through D53 and a 2.2M resistor. As the capacitor discharges, the output of IC20A follows it completing the drive waveform for the wow circuit for Symphonic Wow. The output of IC20A is applied to the Electric Piano and Symphonic Wow filter allowing signal to pass through the filter at the amplitude of the drive waveform.

A positive voltage from the upper keyboard Keydown Detector IC18B is R/C filtered, producing the Electric Piano Drive waveform. This waveform is then routed through Diode D55 to the Symphonic Wow & Electric Piano filter.

16-FOOT R/S TREMOLO DRIVE

ORCHESTRAL CLARINET & ELECTRIC PIANO LAMP DRIVER

Turning on the Orchestral Clarinet or Electric Piano tab applies a positive voltage to the base of Q49, turning it on. When Q49 turns on, it lowers the voltage on the base of Q50 turning it off, applying a positive voltage to the base of Q51 16-foot Preset Voices Lamp Driver. Since Q51 is an emitter follower, its emitter also goes positive, lighting the Lamp in Photocell P1, allowing audio signal to pass to the Main Mixing Preamp IC56B.

VIBES & VIBRA HARP LAMP DRIVE

Turning on the Vibes or Vibra Harp tab applies a positive voltage to the base of Switcher Q47 turning it on. When Q47 turns on, it performs two functions: 1) it turns off Q48, which allows a keydown pulse from the Keydown Detector IC18B to pass through Q49 & Q50 to the base of Q51. This ensures a positive output from Q51 at keydown; 2) Q52 is switched off allowing the output of Q53 to pass to Lamp Driver Q51. Q53 is driven from the vibrato oscillator causing its output to be a low frequency sine wave. This varies the amplitude of Q51's emitter voltage and gives a tremolo effect to the audio signal passing through P1.

MAIN FLUTE DRIVE

The base of Q54 is normally grounded by a contact of the Leslie Trem switch. This causes Q55 Main Flute Lamp Driver to be biased partially on allowing low frequency Flute signal to pass through Photocell P3 to the Main Mixing Preamp. When the Leslie Trem switch is turned on, the base of Q54 is ungrounded. Q54 is driven from the vibrato oscillator causing its output to be a low frequency sine wave. This varies the amplitude of Q55's emitter voltage and gives a tremolo effect to the low frequency Flute signal passing through P3.

Q56-Q67 SWITCHER DRIVERS

Positive voltage from the tabswitches is applied to the emitters of the switcher drivers. This voltage is greater than the base voltage causing the drivers to saturate. The positive collector output then turns on the FET switcher circuit for the chosen voice allowing audio signal to pass to various voicing circuits.

SCHEMATIC 3

UPPER KEYBOARD 2-2/3-, 4-, 5-1/3-, 8- & 16-FOOT FLUTE FILTERS & SWITCHING

Audio signal from the tone generators is divided into groups called Audio Keying Groups (2-2/3, 5-1/3) and Diode Keying Groups (4, 8 and 16). These groups are filtered individually by the Upper Keyboard Flute Filters for each organ footage 2-2/3, 4, 5-1/3, 8 and 16. After filtering, the signal is collected and amplified before being sent to other voicing circuits where the various organ voices are created. The 4, 8 and 16-foot Groups are combined through 8.2K resistors and routed to Reed/String Collector Amps for use on the Reed and String organ voices. The Flute filter outputs are applied to the Flute Mixing Preamp.

FLUTE FILTERS

The Flute Filters are three pole Low-Pass Filters. There are eight filters for each Flute footage. The output of each filter is inverted from, and should be approximately half the amplitude of, the input.

FET SWITCHERS

All FET Switchers are N-Channel depletion mode devices. They are pinched off by a negative voltage at their gate. Turning on the voice associated with each switcher applies a positive voltage to the gate of the FET cancelling the negative voltage. This allows the FET to conduct, permitting the audio signal from the collector lines to pass to the Flute Mixing Preamp.

IC35C PRESET VOICES COLLECTOR AMP

Audio signal from the 16-foot Preset Voices Collector Line is applied to IC35C where it is amplified and applied to the input of Photocell P1. Turning on the Vibes, Vibra Harp, Orchestral Clarinet or Electric Piano tabs (shown on Schematic 2) enables the Lamp Driver Q51 which lights the lamp in Photocell P1, allowing the signal to pass through P1 to the Main Mixing Preamp.

IC35A&B, IC36A 4, 8 AND 16 REED/STRING COLLECTOR AMPS

Audio signal from the 4, 8 and 16-foot Diode Keying Groups is combined and applied to its associated R/S Collector Amp. Here the signal is amplified before being connected to the input of its associated R/S Switcher.

Q71 OUTPHASER SWITCHER

Turning on the Orchestral Clarinet, Hawaiian Guitar or Accordion voice turns on Outphaser Switcher Q71. This combines the 8-foot R/S output with 16-foot R/S audio. This signal is then amplified by the 16-foot collector amp, and routed to filter circuits for the above-mentioned voices.

SCHEMATIC 4

UPPER 2- & 1-FOOT FLUTE FILTERS, LOWER FLUTE FILTERS, R/S COLLECTORS & CHORUS SWITCHING

Audio signal from the tone generators is divided into groups called Diode Keying groups. These groups are filtered individually by the Upper and Lower Keyboard Flute Filters. The Lower Keying Groups are tied together through 8.2K resistors and form the Reed and String signal for the lower keyboard voices. The output from the Magic Chord preamp is connected to the F#2-B2 Lower 8-foot Flute Filter IC45B. The output from the Magic Genie 4-foot TOS is applied to the 4-foot Magic Chord Preamp IC47A. The Flute signal is amplified by the Flute Mixing Preamp and routed to the Leslie Volume Regulator, Chorus Mixing Preamp, Reverb and the Main Channel Flute Low-Pass Filter.

FLUTE FILTERS

The Flute Filters are three-pole low-pass filters. The output of each filter is inverted from, and should be approximately half the amplitude of, the input.

IC46A FLUTE MIXING PREAMP

All Flute audio from the upper and lower keyboard Flute Filters is applied to IC46A where the signal is amplified. The output signal is applied to the Leslie Volume Regulator IC163, Reverb Driver IC161A, Main Channel Flute Low-Pass Filter IC36B and Flute Chorus Switcher Q87.

IC36B MAIN CHANNEL FLUTE LOW-PASS FILTER

Low frequency Flute audio is allowed to pass through the Flute Low-Pass Filter IC36B and is applied to the Main Flute Photocell P3. A steady DC voltage is applied from the Flute Lamp Driver Q55 to the lamp keeping the photocell resistance low and passing the low frequency audio to the Main Mixing Preamp IC56B. Placing the Leslie Tremolo Switch to on allows the Flute Lamp Driver DC voltage to be modulated by the vibrato. This causes the Photocell Lamp to vary in intensity which gates the low frequency audio through P3 creating a tremolo effect for the Low Frequency Main Channel Flutes.

Q86, Q87 FLUTE CHORUS SWITCHER

When the Flute Chorus tab is off, a negative voltage is applied to the gate of Flute Chorus Switcher Q87 pinching it off, preventing audio from reaching the Chorus Mixing Preamp. Turning on the Flute Chorus tab applies a positive voltage to the base of Chorus Amplitude Switcher Q86. This shunts the 100K resistor to ground, reducing the amplitude of the Flute audio to compensate for the amplification accomplished by the Chorus Mixing Preamps and the Phase Amplifiers. The negative voltage is removed from the gate of Q87 allowing it to conduct. This permits the audio signal to pass to the Chorus Mixing Preamp IC46C.

IC47B, LOWER KEYBOARD 4 R/S COLLECTOR AMP

Audio signal from the 4-foot lower keyboard diode keying groups is combined through 8.2K resistors and applied to the input of the 4-foot lower keyboard R/S Collector Amp. Here this audio signal is amplified and routed to the Lower 4-foot R/S Switcher and to the Vox Humana Filter.

IC48B LOWER KEYBOARD 8 R/S COLLECTOR AMP

Audio signal from the 8-foot lower keyboard diode keying groups is combined through 8.2K resistors and applied to the input of the 8-foot lower keyboard R/S Collector Amp IC48B. Here the signal is amplified and routed to the 8-foot lower keyboard R/S Switcher and to the Vox Humana Filter.

VOX HUMANA FILTERING, SWITCHING

The 4-foot component of the Vox Humana voice is filtered and amplified by IC48A. IC48C filters and amplifies the 8-foot component of the Vox Humana voice. The Vox Humana Mixing Preamp Q88 combines and amplifies the 4- and 8-foot signals. Q89 is an N-Channel FET which is pinched off by a negative voltage at its gate. Turning on the Vox Humana tab removes the negative voltage from the gate of Q89 enabling the Vox Humana signal to pass to the Vox Humana and Lower Symphonic String Mixing Preamp.

SCHEMATIC 5

FLUTE PRESET AND CANCEL UPPER

FLUTE PRESET

FLUTE PRESET LATCHES

Each Flute preset latch consists of a switch, inverter and a "D" Flip-Flop. IC21 is a Hex Schmitt trigger; it has a specific threshold voltage. Pressing a preset switch drops the input of IC21 below its negative threshold resulting in a high at its output. As the switch is held in, a phenomenon called switch bounce occurs. The switch bounces and the .1 capacitor charges and discharges, but the voltage never reaches the positive threshold of IC21 and its output remains high until the pushbutton is released. (If a normal inverter were used in this circuit, its output would change with each bounce of the switch. This would clock the input of IC51 and IC52 an indeterminate number of times, making it impossible to determine the end state of IC51 and IC52.) For discussion purposes, references for Flute Preset 1 will be used.

When the output of IC21B goes high, it applies a pulse to the clock input of "D" Flip-Flop IC51A. IC51A is normally in a reset condition - Q low and Q bar high. After clock, both outputs change state and will remain in this condition until 1) the same preset is pressed again applying a pulse to the clock input of IC51A, or 2) pressing a different Flute preset will apply a negative reset pulse (through Diodes D132-D137) to the other two "D" Flip-Flops resetting their outputs and cancelling any preset that was previously on.

Q93-Q98, Q103 & Q104 LAMP DRIVERS, SWITCHERS & R/S CANCEL

FLUTE PRESET

When a preset is active the Q output of the Flute Preset Latch is high and the Q bar output is low. The high from the Q output is applied to the base of a lamp driver, turning it on and lighting the preset lamp. The high is also applied to a Flute Preset Switcher, turning it on which applies positive voltage to the appropriate Flute Switcher Drivers for that preset.

REED/STRING CANCEL

When a Flute Preset is turned on, positive voltage is applied from a Flute Preset Switcher to the Cancel Enable Q103. Q103 turns on which removes the positive voltage applied to Q105 and cancels the upper Reed/String voices. Q104 is turned off which removes voltage from the upper Reed/String effects.

UPPER CANCEL LATCH

The Cancel Upper Latch consists of a switch, inverter and a D Flip-Flop. IC21E is a Hex Schmitt trigger. It has a specific threshold voltage. Pressing the Cancel Upper switch drops the input of IC21E below its negative threshold, resulting in a high at its output. As the switch is held in, a phenomenon called switch bounce occurs. The switch bounces and the .1 capacitor charges and discharges, but the voltage never reaches the positive threshold of IC21E and its output remains high until the pushbutton is released. (If a normal inverter was used in this circuit, its output would change with each bounce of the switch. This would clock the input of IC52B an indeterminate number of times, making it impossible to determine the end state of the Flip-Flops). When the output of IC21E goes high, it applies a pulse to the clock input of IC52B. The Flip-Flops are normally in a set condition - Q high and Q bar low. After clock, the outputs change state and will remain in this condition until the Cancel Upper button is pressed again.

Q99-102 UPPER CANCEL LAMP DRIVER, ENABLE, BUSS DRIVER, AUDIO CANCELLER

When IC52B is clocked, the Q output goes high and turns on Q99, lighting the lamp which is part of the Cancel Upper switch. The Q bar output goes low. If at this time no Orchestral Symphonizer preset is on, the base of Q100 is high and nothing happens. Pressing an Orchestral Symphonizer preset applies a low from IC21F to the base of Q100. With the Q bar output of IC52B low and an Orchestral Symphonizer preset on, the base of Q100 is low turning off Q100. The Upper Keyboard DC keying voltage is removed from the Keyswitch Buss by turning Q101 off. The audio keyed voices (5-1/3-, 2-2/3- and 2-2/3-foot Harmonic) are cancelled by removing positive voltage from their FET switchers by turning on Q102. Under the above conditions, only the Symphonizer preset will be heard.

NOTE: If the Orch to Lower tab had been pressed, positive voltage from the Orch to Lower switch would be applied to Q100, keeping the base of Q100 high. This prevents cancellation of the Upper Keyboard when the Symphonizer is played on the Lower Keyboard.

Q105-113 R/S SWITCHER DISABLE, FLUTE AND HARMONIC 2-2/3-FOOT SWITCHER DRIVERS

Positive voltage from the tabswitches or from the Flute preset circuit is applied to the emitters of the switcher drivers. This voltage is greater than the base voltage causing the drivers to saturate. The positive collector output then turns on the FET switcher circuit for the chosen voice allowing audio signal to pass to various voicing circuits.

SCHEMATIC 6

UPPER AND LOWER SYMPHONIC STRING FILTERS

SYMPHONIC STRINGS

Each footage of Symphonic Strings is filtered in half-octave groups and routed to a collector amp. Here the signal is inverted and amplified. Turning on a Symphonic String tab allows this signal to pass through its associated FET switcher to the Upper or Lower String Volume Control VR11 or VR12. At the output of the volume control, the audio signal is routed to the chorus modulator circuit where it is phase modulated - creating the Symphonic String effect.

FET SWITCHERS

All FET switchers used are N-Channel depletion mode devices (normally conducting). They are pinched off by a negative voltage at their gate. Turning on the voice associated with each switcher applies a positive voltage to the gate of the FET cancelling the negative voltage, allowing them to return to their unbiased state. This permits the audio signal from the collector amps to pass to the chorus modulator circuit.

The positive voltage for the Upper Symphonic String voices is supplied by the switched +6 volt source. When a Flute Preset switch is pressed, the +6 volts is switched to a negative voltage, cancelling the Upper Symphonic Strings (see Schematic 5).

SCHEMATIC 7

LOWER DC KEYSWITCHING, TABSWITCHING, GENIE MODULATOR & AUTO RHYTHM START

There are 61 lower DC keyswitches the C1-C4 and C#4-C6 keyswitches having a separate keyswitch on buss. Pressing a C1-C4 keyswitch applies voltage to a diode keying circuit through Diode D189, a 470 ohm resistor and Coil L6. Pressing a C#4-C6 keyswitch applies voltage to a diode keying circuit through a 470 ohm resistor and Coil L7. This voltage biases on Diodes D187 and D188, allowing audio signal to pass to the lower keying groups. These groups are represented by a bold line on Drawing 4. A positive voltage is also applied to the Manual Rhythm Trigger Q337 when a C1-C4 keyswitch is being held.

With the Magic Chord on, the A1-A2 lower DC keyswitches are disabled by grounding the cathodes of Diodes D174-D186. Pressing a key in this range at this time outputs a chord from the Chord Function Generator which is routed to the lower keyboard filtering circuits. Also, when in the chord mode the A2 keyswitch becomes the 7th switch. Pressing the A2 keyswitch at this time applies positive voltage to the 7th Enable Q272 which adds the 7th component to the Magic Chord being played.

RHYTHM START

Placing the Rhythm Start tab in the on position resets Rhythm Start Flip-Flop IC58B. This causes the Q bar output to go high turning on Rhythm Start Switcher Q128, lowering the voltage on the base of the multi-starter which enables the rhythm to start.

AUTO RHYTHM START

Turning on the Auto Start tab (Rhythm Start tab off) performs two functions: 1) the set input of IC58B goes high allowing IC58B to be clocked and 2) the output of the Keydown Detector Q123 is connected to Inverter IC57A. Pressing a lower keyboard keyswitch lowers the voltage on the base of Q123 turning it on. The high level at the collector of Q123 is inverted through IC57A and resets Flip-Flop IC58B. This causes the Q bar output of IC58B to switch high, turning on Switcher Q128 which enables the rhythm to start. If the lower keyboard keys are released and the counter output from IC102 is high, indicating the first half of a rhythm measure, the rhythm will continue to play to the end of that measure. If the counter output is low, this indicates the last half of a rhythm measure and the rhythm will continue to play to the end of the following measure. This is accomplished by the following: To stop the Rhythm Pin 11 of IC57D must make a positive transition, clocking the Q bar output of IC58B low. At this time IC58A is in a reset condition (Q output low), this locks the output of IC57D high. When the lower keyboard keys are released, the output of IC57A switches high. This high level enables IC57C. When Pin 13 of Counter IC102 is high, the output of IC57C switches low. This sets the Q output of IC58A high which is applied to Pin 12 of IC57D. The output of IC57D remains unchanged at this time. The next negative transition of the counter is inverted through IC57B and applied to Pin 13 of IC57D. Both inputs to IC57D are now high and its output goes low. This has no effect on the output state of IC58B. On the next positive transition of the counter, the output of Inverter IC57B switches low. The inputs to IC57D are opposite causing its output to switch high clocking IC58B. This causes the Q bar output Pin 8 of IC58B to go low turning off Switcher Q128 which stops the rhythm. Also, when Pin 8 goes low it resets IC58A. This ensures that IC58A will always be in a reset condition (Q low) at the onset of the Auto Stop sequence.

NOTE: After releasing the keys, the counter must make a negative transition then a positive transition, in that order, before the rhythm shuts off. This causes the turn-off time to vary depending on the state of the counter output when the keys are released.

GENIE MODULATOR

Audio signal from the lower 4- and 8-foot R/S Collector Lines is applied through Switchers Q124 and Q125 to Pin 3 of the Genie Modulator IC55. Signal can only pass through IC55 when a positive voltage is applied to Pin 5. With the rhythm off, Genie Accompaniment Switcher Q127 is off and a positive voltage is routed through the Genie Voices tab to Pin 5 of IC55. This allows audio signal to have a constant path through IC55. Turning on the Genie Voices tab at this time will have no audible effect. With the Rhythm Start tabswitch on, a positive voltage from the Rhythm On Switcher (see Schematic 14) is routed to the base of Q127. This turns Q127 on, which allows positive voltage pulses from the Genie Modulator Driver to pass through D195 and the Genie Voices tab to Pin 5 of IC55. This gates the audio signal through IC55 in time with the Rhythm. Turning on the Genie Voices tab at this time applies a steady positive voltage to Pin 5, giving the capability of playing the lower R/S voices unmodulated when using the rhythm section.

With the Rhythm Auto Start tabswitch on, Q126 Auto Stop Chord Hold Killer is turned on applying a positive voltage to the base of Q127. This positive voltage turns Q127 on removing voltage from Pin 5 of IC55. When the rhythm is started, pulses from the Genie Modulator Driver will gate audio signal through IC55. When the lower keys are released and the rhythm stops, Pin 5 of IC55 will remain low. This prevents audio from being heard if the Magic Chord and Chord Hold functions were enabled.

The audio signal outputted from the Genie Modulator is applied through the Modulator Follower to the Genie Volume Control. The modulated signal is then routed to the Lower Keyboard Switchers (see Schematic 8).

SCHEMATIC 8

REED/STRING QUALITY CONTROL

Audio signal from the R/S collector amps and Genie volume control is routed to various filtering circuits where the character of each voice is created. The output of each filter circuit is then routed through the Main mixing preamp to reverb and main volume regulator circuits. The Trumpet filter is used to filter Orchestral Clarinet and Hawaiian Guitar audio signal. The Hawaiian Guitar gain switcher lowers the amplitude of the input signal to the Trumpet Amp IC63B when the Hawaiian Guitar tab is on.

IC62 & IC63A PERCUSSION & SLOW ATTACK MODULATOR & VOLTAGE FOLLOWER

Violin, Accordion and Piccolo are the Slow Attack voices of the organ. Turning on any of these tabs applies signal to the input (Pin 3) of IC62. Signal is gated through IC62 when positive voltage is applied to Pin 5 from the Slow Attack Modulator Driver Q46. This creates the Slow Attack effects for these voices.

Banjo, Mandolin, Harmonic 4 and Harmonic 2-2/3 are the Percussion voices of the organ. Turning on any of these tabs applies signal to the input (Pin 3, Pin 2 for the Banjo voice) of IC62. Signal is gated through IC62 when positive voltage is applied from the Percussion Driver Q45 to Pin 5 of IC62. This creates the Percussion effect for these voices.

The signal is then applied to the input of IC63A where it is transformed into a low impedance signal before being applied to the Main Mixing Preamp IC56B.

IC66, IC67, Q149, Q150 ELECTRIC PIANO & SYMPHONIC WOW FILTER & EMITTER FOLLOWERS

This circuit is a State Variable Filter that acts in conjunction with the 800P capacitors to form an RC low pass filter. Signal from the R/S 16 signal line is gated through the filter at the amplitude of the drive waveform applied to Pin 5 of IC66 and IC67. The output is a low impedance signal that is routed to the Main Mixing Preamp when the Electric Piano tab is turned on. Turning on the Symphonic Wow tab routes the signal to the Chorus Mixing Preamp.

SCHEMATIC 9

UPPER ORCHESTRAL SYMPHONIZER & 16-FOOT LOW OCTAVE KEYING

The purpose of the low-octave keying circuits is to provide the octave frequencies for the 12 lowest 16-foot notes. If two or more low octave notes are pressed, only the lowest note will be heard.

16-FOOT LOW OCTAVE KEYER

Pressing a 16-foot low octave keyswitch applies audio signal to Divider IC70 where the frequency is divided to create the 16-foot pitch. The audio signal is applied to Q157. Diodes D235 and D236 rectify the audio signal into a low level. This low causes Q158 to turn on, forward biasing D237 and D238 and applying audio signal to the 16-foot Flute Filter.
NOTE: If the Cancel Upper switch and an Orch.Symp.Preset were on, the switched +24 volt supply would be low preventing the 16-foot Flute from being keyed.

ORCHESTRAL SYMPHONIZER LOW OCTAVE KEYING

Pressing an upper keyboard low octave keyswitch with an orchestral symphonizer preset on applies positive voltage to the base of Q155 through either the Brass or Piano/Guitar keying line. Only one of these keying lines can be enabled at any one time. The amplitude of keying voltage through the Brass keying line is such that the .33 uf capacitor charges relatively slow. This produces a steadily rising voltage at the emitter of Q155, causing the 330K resistor and the .0056 uf capacitor to charge to a changing reference. On initial keydown, this will cause the output of Q156 to vary from a wide pulse width of small amplitude to a narrow pulse width of higher amplitude and creates the breathy keydown effect for the Brass voices. After the emitter of Q155 reaches its maximum DC level, the output of Q156 will be a pulse waveform with approximately a 10% duty cycle at the frequency of the input signal. The output of Q156 then passes through diode D232 to the Orchestral Symphonizer Pulse Keyer Filter. Releasing the key causes any remaining capacitor charge to discharge through D230 and a 120K resistor to ground. The keying voltage through the Piano/Guitar keying line is of a higher amplitude and is applied as a pulse to the base of Q155. This causes the emitter of Q155 to go to its maximum voltage at keydown creating a positive pulse at the collector of

Q156. This pulse is routed through D231 to the strike tone amp and creates the percussive keydown effect fo the Piano and Guitar presets. Also the emitter voltage from Q155 biases on Diode D233 allowing audio signal to pass to the sawtooth filtering groups. If the key is held down, the decay time of this pulse is determined by voltage on the snub line through Diode D225. After the snubbing, the remaining capacitor voltage holds on Q155 for the duration of its discharge time. If the key is released before the decay is complete, the capacitor discharges through Diode D230 and a 120K resistor to ground. (This discharge path is blocked as long as a key is being held because of the reverse bias condition of D230.) **NOTE:** If an Orchestral Piano preset is on, the glide switch becomes a sustain switch. The sustain switch will have no affect on the Symphonizer Low Octave Keyer.

SCHEMATIC 10

PEDAL KEYING AND PEDAL WOW DRIVE

Pressing a bass pedal causes the following:

1) A pulse is developed across the .22 capacitor (connected to the C1 Pedal Switch) causing the Pedal Cancel Trigger to operate.
2) A generator output Diode D244 is biased on, allowing tone generator signal to pass through D245 or D246 to the base of Pedal Collector Amp Q164 or Q165.
3) A 5.6 mfd capacitor is charged, which holds the Generator Output Diode on after the pedal has been released.
4) The Pedal Keydown Detector conducts, supplying the enable voltage for the Pedal Shimmer Generator, Pedal Trigger, Orchestral Symphonic Trigger and Mute and Detuning Trigger.

Q161, Q162 PEDAL CANCEL TRIGGER

Pressing a pedal develops a pulse across the .22 capacitor connected to the C1 Pedal Switch. This momentarily lowers the voltage on the base of Q161, turning it off. When Q161 turns off, it applies a positive voltage pulse to the base of Q162. This causes Q162 to turn on, momentarily grounding the Pedal Keying Line which discharges any previously charged 5.6 uf pedal sustain capacitor. This turns off the signal path of the previously played pedal making sure that only the signal from the pedal being played enters the Pedal Divider. (If more than one signal at a time enters the Pedal Divider, rumble will occur.) The positive output from the collector of Q161 is also used to trigger the Pedal Wow and Pedal Rhythm circuits.

Q164 & Q165 HIGH AND LOW OCTAVE PEDAL COLLECTOR AMPS

High octave pedal signal (C2-C3 Pedal Switches) and Low octave pedal signal (C1-B1 Pedal Switches) is applied to the base of their associated Pedal Collector Amp. Here the signal is amplified, providing the drive signal for the pedal divider. The divider outputs provide the audio signal for the 8- and 16-foot pedal voices. The 8-foot outputs are also routed to the Orchestral Symphonic Pedal keying circuit for use when the Orchestral to Pedal preset is on.

Q163 PEDAL KEYDOWN DETECTOR

Playing a bass pedal applies a positive voltage to the emitter of Q163. Because of its lower base potential Q163 turns on. This applies a positive voltage to the Pedal Shimmer Generator, Pedal Trigger, Pedal Orchestral Symphonic Trigger and Mute and Detuning Trigger enabling these circuits to operate.

PEDAL 8, PEDAL 16 KEYING

Pressing a pedal applies a positive voltage from the collector of Q163 to the base of Q168. This turns on Q168, lowering the voltage on the base of Q169 which also turns on. When Q169 turns on, a positive voltage is applied to the base of Q170. This keyer turns on applying positive voltage to the diode readout circuits at its emitter. This allows audio signal from the Pedal Divider to pass to the Pedal String and Pedal 8/16 filter circuits. The capacitor at the base of Q170 is charged by Q169. If sustain is off, the capacitor discharges through a resistor and the Pedal Sustain tabs to ground. If sustain is on, ground is removed and the capacitor discharges onto the base of Q170 holding them on. This allows audio signal to pass to the filtering circuits for a short time after the pedal has been released creating the pedal sustain effect. The positive output from the emitter of Q170 is also applied to the base of the Genie Bass Killer Q176.

Q176 GENIE BASS KILLER

The Genie Bass Killer Q176 has a positive voltage applied to its base from the Pedal Keyer Q170 each time a pedal is played. This voltage causes Q176 to turn on which grounds the output of the Genie Bass Emitter Follower Q187, cancelling the Lower Keyboard Genie Bass until the pedal is released. This makes it possible to play the bass pedals at various intervals while the Genie Bass is being used.

ORCHESTRAL TO PEDAL

With the Orchestral to Pedal tab on, a positive voltage turns on Q173 & Q175. With Q175 on, Q174 is enabled and when a pedal is pressed, a positive voltage is applied from the collector of Q163 through Q174. This voltage is routed to the Trumpet Mute Drive circuit and is also applied as a detuning pulse to the Master Oscillator, when the Orchestral Symphonizer voices using these effects are on. (See Schematic 18.)

With Q173 on, the Orchestral Symphonizer trigger is enabled by grounding the emitter of Q172. When a pedal is pressed, a positive voltage is routed to the base of Q172 from Q163. If at this time an Orchestral Symphonizer preset is on, collector voltage is supplied to Q172 from the Orchestral Symphonizer Driver and Q172 turns on. This lowers the voltage on the base of Q171, turning it on supplying positive voltage to the Orchestral Symphonizer pedal keyer circuit. The Orchestral Symphonizer pedal keyer circuit operates allowing audio signal to pass to the Orchestral Symphonizer filter circuits.

PEDAL WOW DRIVE

Normally the output Pin 4 of IC19C is high. When a positive pulse from the Pedal Cancel Trigger occurs, the output of IC19C goes low, which switches the output of IC19D high.

The feedback between IC19C and IC19D makes them a Set/Reset Flip/Flop. At the same time, the pulse from Q161 causes the Keydown Reset Q166 to discharge the .15 uf timing capacitor at the collector of Q167. The timing capacitor then charges through the Ramp Driver Q167 (giving a linear ramp). As the voltage on the capacitor increases, the output Pin 14 of IC20C follows it. When the output of IC20C is .6V higher than the voltage setting of the Range Control VR23 the output Pin 8 of IC20D (normally low) goes high, resetting the Set/Reset Flip/Flop causing the output of IC19D to go low. When IC19D goes low, the timing capacitor discharges through D252 and a 2.2M resistor. As the capacitor discharges, the output of IC20C follows it completing the drive waveform for the wow circuit for Symphonic Wow. The output of IC20C is applied to the Pedal Wow filter allowing signal to pass through the filter at the amplitude of the drive waveform.

SCHEMATIC 11

GENIE BASS, PEDAL & PEDAL WOW FILTERING & SWITCHING

GENIE BASS

Q180-Q182 HIGH & LOW BASS SELECTORS

With a Rhythm on, the output from Pin 26 of the ROM IC103 is applied to the bases of Q180 and Q181 through the Rhythm Start tab contacts. When Pin 26 is high, the High Bass note from Pin 6 of the CFG IC85 is grounded out through Q180 and the Low Bass note from Pin 7 of the CFG is allowed to pass to the base of Divider Driver Q183. When Pin 26 goes low, Q182 is turned on through Q181, grounding out the Low note allowing the High note to reach Q183. With no Rhythm on, the bases of Q180 and Q181 are held high allowing only Low Bass signal to pass to Q183. In the Boogie Woogie Bass mode, a positive voltage is routed from the Magic Chord tab to the bases of Q180 and Q181, allowing the signal output from Pin 7 of the CFG to reach the base of Q183.

NOTE: In the Boogie Woogie mode of operation, there is no audio signal output from Pin 6 of the CFG. The positive voltage from the Magic Chord tab holds Q182 off, assuring a constant signal path for the Low-Root output Pin 7 of the CFG.

Q183, PART OF IC102, DIVIDER DRIVER & GENIE BASS DIVIDER

Audio signal from Pins 6 & 7 of the CFG IC85 is applied to Q183 where it is amplified. This signal is applied to the Genie Bass Divider IC102 where it is frequency divided exactly in half. The signal output from the Divider is then applied to the Genie Bass Keyer Q186.

Q184, Q185 GENIE BASS PULSE DETECTOR & GENIE BASS DRIVER

Turning on a rhythm triggers the Bass Pulse Detector from the Boogie Woogie Bass Triggers or Pin 22 of IC103 (depending on the position of the Boogie Woogie Bass tab). When the trigger is low, voltage on the base of Q184 is lowered, causing it to conduct. A positive voltage is then applied to the base of Q185, causing it to conduct which applies positive voltage to the Genie Bass Keyer Q186, gating the base signal through the keyer at the speed of the rhythm. When the trigger goes high, Q184 turns off, causing Q185 to turn off, shutting off the signal path through the Genie Bass Keyer.

With the rhythm off, the cathode of Diode D278 is grounded. This lowers the voltage on the base of Q184, turning it on, which applies a steady positive voltage to Q185, holding it on, creating a constant signal path through the genie Bass Keyer Q186, allowing the Low Bass signal to pass unmodulated.

NOTE: With the rhythm off, the cathode of D279 is also grounded. This creates a voltage divider network through the 560 ohm and adjusts the DC level on the base of Q185.

Q186 GENIE BASS KEYER
Audio signal from the Genie Bass Divider is applied to the Genie Bass Keyer Q186. Each time a positive pulse from the Genie Bass Driver Q185 is applied to Q186, it allows audio signal to pass through Q186. This signal is then applied to the Genie Bass Emitter Follower Q187.

Q187 GENIE BASS EMITTER FOLLOWER
Audio signal from the Genie Bass Keyer passes through Q187 and is transformed into a low impedance signal. This signal is then routed to the Genie String Bass and Guitar Bass Switchers Q188 and Q189.

GENIE GUITAR & STRING BASS SWITCHING
Turning on the Genie Guitar Bass tab applies positive voltage to Switchers Q188 & Q189. This turns on the FET Switchers allowing audio signal from Q187 to pass to the Guitar Bass and String Bass filters. Turning on the Genie String Bass tab or the Magic Chord tab with the Boogie Woogie Bass tab, applies a positive voltage to Q189 turning on FET Switcher Q189. This allows audio signal to pass to the String Bass Filter IC61B. The audio signal is filtered through IC73A & IC61B then passes to the Bass Mixing Preamp.

PEDAL 8, PEDAL 16
Audio signal from the 16-foot Pedal Keying is applied to the input of the Diaphone and Pedal 16 FET Switchers Q192 & Q194. Turning on the tabswitches applies a positive voltage to the cathode of D283 or D284, turning on the FET switchers. This allows audio signal to pass through the FET switchers to the Diaphone and Pedal 16 filtering circuits. After filtering the signal is routed to the input of the Bass Mixing Preamp IC73B.

Audio signal from the 8-foot Pedal Keying is applied to the input of the Pedal Keying is applied to the input of the Pedal 8 FET Switchers Q190 & Q191. Turning on the Pedal 8 tab turns on the FET switchers. This allows audio signal to pass through the FET switchers to the Pedal 8 filtering circuits. After filtering, the signal is routed to the input of the Bass Mixing Preamp IC73B.

PEDAL WOW
This circuit is a State Variable Filter that acts in conjunction with the .001 capacitors to form an RC low pass filter. Signal from the 8-foot Pedal Keying is gated through the filter at the amplitude of the drive waveform applied to Pins 5 of IC74 and IC75. The output is a low impedance signal that is routed to the Bass Mixing Preamp IC73B when the Pedal Wow tab is turned on.

IC73B, Q200 BASS MIXING PREAMP & EMITTER FOLLOWER
All Bass audio signal is routed to the Bass Mixing Preamp. Here the signal is amplified and routed to the base of Emitter Follower Q200. Depending on which of the Pedal Volume Switches is on, the resistance to ground at the output of IC73B is varied regulating the amplitude of the signal applied to the base of Q200. The audio signal applied to Q200 is transformed into a low impedance output signal and routed to the reverb circuit and the Main and Leslie amplifiers.

SCHEMATIC 12

FLUTE AND STRING CHORUS MODULATOR

All three channels, Phase 1, 2 and 3, of the Chorus Modulator are identical in operation. For discussion purposes the schematic references for Phase 1 are used in the description below.

Q213, Q214 CLOCK 1 AND PULSE SHAPER
Clock 1 Q214 oscillates at a frequency of 19Hz. The output from Clock 1 is applied to the Pulse Shaper Q213 where it is amplified and applied to the input of the high frequency Divide-by-3 network. Here the waveform is divided and appears as three outputs with a 120 degree phase shift between Pins 6 and 4, 4 and 2 and 2 and 6. With the Chorus Celeste switch in the Celeste position, Clock 1 is disabled, and the chorus runs at the speed of the low frequency clock, Clock 2.

Q205, Q206 CLOCK 2 AND PULSE SHAPER
Clock 2 Q205 oscillates at a frequency of 2.2Hz. The output from Clock 2 is applied to the Pulse Shaper Q206 where it is amplified and applied to the input of the low frequency Divide-by-3 network. Here the waveform is divided and appears as three outputs with a 120 degree phase shift between Pins 6 and 4, 4 and 2, and 2 and 6.

PHASE 1, 2 AND 3 FILTERS
The similar outputs from the high and low frequency divide-by-3 networks are combined and applied to a low pass filter tuned to approximately 1 Hz. The output from the filter is a low frequency, irregular sine wave which is used as the drive signal for the voltage-controlled oscillator.

IC78, IC80, IC82 VOLTAGE-CONTROLLED OSCILLATOR

The output of the voltage controlled oscillator is a triangle waveform 2 volts peak-to-peak with an average DC level of 5 volts. The frequency of this waveform is dependent on the amplitude of the drive signal from the filters. Since the drive signal is an irregular waveform, the output frequency of the oscillator is constantly varying. The output from the oscillator is then applied to the phase splitters.

Q217-219, Q225-227, Q233-235 PHASE 1, 2 AND 3 PHASE SPLITTERS

The collector and emitter outputs of Q217 follow the output from the voltage controlled oscillator (the collector output being inverted). When the collector of Q217 is high, Q218 turns on applying a negative pulse to Pin 5 of IC79. When the emitter of Q217 goes high, Q219 turns on applying a negative pulse to Pin 2 of IC79.

IC46B, IC46C, Q203, Q204 CHORUS INVERTER, MIXING PREAMP

Audio signal from the Vox Celeste and Lower String circuits is combined and amplified by the Chorus Inverter IC46B. This audio is then combined with audio signal from the Flute, String and Symphonic Wow circuits by Chorus Mixing Preamp IC46C and applied to the input preamps. The input preamps amplify this signal which is then routed to the inputs of the Phase 1, 2 and 3 Bucket Brigades.

IC79, IC81, IC83 BUCKET BRIGADE

The Bucket Brigades are analog shift registers which sample the input audio signal at the rate of the Clock pulses from the Phase Splitters. Each time a negative clock pulse is applied to Pin 2 and then Pin 5 of IC79, the audio signal is transferred to the next stage of the Bucket Brigade until it appears as output at Pin 6. This causes a delay between the input and output signal. Since the frequency of the clock pulses are constantly varying, the delay time of the signal through the Bucket Brigade also varies, phase modulating the audio. The delay time of Phase 1, 2 and 3 are constantly varying but will never be the same at any one time. The audio signal output from the Bucket Brigade is then applied to the low pass filters.

Q220 & Q221, Q228 & Q229, Q236 & Q237 LOW PASS FILTERS

The low pass filters filter out the high frequency clock component that is contained in the audio signal. The outputs of the Phase 1, 2 and 3 Low Pass Filters are then cross-coupled for amplitude variation before being applied to the output amps.

Q222, Q230, Q238 PHASE 1, 2 AND 3 OUTPUT AMPS

The audio signal from the low pass filters is applied to the output amps where it is amplified and routed to the Main, Phase 2 and Phase 3 Volume Regulators.

SCHEMATIC 13

AUTOMATIC ORGAN COMPUTER (AOC)

Automatic Organ Computer (AOC) consists of Upper Keyboard AOC keyswitches (C3-C6), Lower Keyboard DC keyswitches (C1-C4), and in the Magic Chord mode the Magic Genie AOC Decoder is used in place of the A1-A2 DC keyswitches. Listed below is an example of what happens when a C Major chord is held on the Lower Keyboard and the C6 Upper Keyboard key is pressed.

1) With the AOC tabswitch on, holding a three-finger or a one-finger Magic C Major chord (C, E and G) on the Lower Keyboard applies a positive voltage (from the C1-C4 Lower Keyboard keyswitches or the Magic Genie AOC Decoder) to the C, E and G AOC Drivers. Here the voltage is amplified and applied to the emitters of all the C, E and G AOC Keyers Q241 via Diodes D297.
2) Upon pressing the Upper Keyboard C6 Key:
    a) the C6 DC keyswitch contact (see Schematic 2) receives a positive voltage from its on buss and keys the C6 note through the Upper Keyboard Diode Keying circuitry.
    b) the C6 AOC keyswitch contact is grounded by its on buss which lowers the voltage on the base of nine AOC keyers - namely C#5, D5, D#5, E5, F5, F#5, G5, G#5 and A5. Since in this range only E5 and G5 have voltage applied to their emitters from the Lower Manual keyswitches or the Magic Genie AOC Decoder (via the AOC Drivers) they are the only two AOC keyers that will conduct, applying voltage to the Upper Keyboard E5 and G5 Diode Keying circuit. Thus, E5 and G5 will be heard along with C6. The output from the AOC Drivers is also applied to the Golden Harp Enable Transistors Q473.

Q244 GOLDEN HARP ENABLE

Each time a Lower Keyboard key is pressed, the voltage at the base of Q244 will decrease turning on Q244. This applies a positive voltage to the base of Golden Harp Enable Switcher Q244 turning it on. A low is routed to the Harp Enable Line (Schematic 22).

SCHEMATIC 14

CHORD FUNCTION GENERATOR [CFG]

CHORD FUNCTION GENERATOR IC85

The Chord Function Generator IC85 contains a scanning system, five programmable frequency generators and the required logic to provide four output features which are bass, chord, strum and arpeggio. The scanning system is capable of scanning 72 time points on a sequential basis. The scan matrix is partitioned in a 12 (X scan) by 6 (Y scan) array. Sequential pulses are outputted on the 12 X lines and a particular time point is active when one of the X lines is connected to one of the Y lines. In the non-chord mode (Magic Genie Chord tab off) the bass feature is the only function that is enabled. In this mode of operation bass signal is outputted from Pins 6 & 7 of the CFG. In the chord mode (Magic Genie Chord tab on) circuitry is enabled to add data bits. These bits correspond to the notes in the chord being played. For example, if a chord is being played there will be data bits at 3 of the 72 time points. If the A2 Key (which is the 7th switch) is pressed, a fourth data bit is added to the chord; pressing the minor footswitch shifts the data at one of the time points creating the minor of the chord being played. The minor and 7th of the chord reset with each new keydown. The other features of the chip, strum and arpeggio, can also be enabled when the chip is in the chord mode. All the features are outputted when a key is pressed. If the chord hold tab is turned on, the features latch and will continue to play after the key is released. Turning on a rhythm disconnects Pin 21 of the CFG from Pin 31 of the CFG. This sets up the CFG to accept rhythm pulses for triggering the Boogie Woogie Bass sequence.

NOTE: The Arpeggio, 7th, Minor, Chord Hold, Magic Chord and Any Rhythm On features of the CFG are inverse functions. This means that the time points for these functions are active when the feature is not playing. To enable these functions to operate, the X and Y lines associated with them must be disconnected.

Q287 CHORD FUNCTION MASTER OSCILLATOR

Q287 develops a continual high frequency signal of approximately 500 KHz that is applied to Pin 3 of IC93B and IC96B. With the D input and Q bar output of IC93B tied together, IC93B becomes a divide-by-two divider. It also acts as a buffer stage between the Master Oscillator and the CFG. The divided-by-two clock frequency from IC93B is applied to five programmable frequency generators via Pin 24 of the CFG IC85. The programmable generators are each capable of generating one of 12 frequencies, dependent on the address code provided them. These generators supply the audio signal for the bass in both the chord and non-chord mode of the CFG. The generators also supply the audio signal for the Magic Chords, Strum and Arpeggio features in the chord mode of the CFG. The divided clock frequency from IC93B is also applied to IC95A&B where it is divided-by-two twice and routed to the Clock Input of the Magic Genie AOC and 4-foot Decoder IC99. The signal output from Q287 that is applied to IC96B is divided-by-three by IC96A&B with an output of approximately 166 KHz at Pin 9 of IC96B. This signal is applied to Pin 2 of IC97 and IC98 where it is divided and used for the 4-foot Magic Chord signal.

MAGIC GENIE CHORDS

Turning on the Magic Chord tabswitch performs the following functions:

1) The base of 7th Enable Q271 is ungrounded allowing positive voltage to reach its base.
2) Positive voltage is routed through Diode D338 to the base of B.W.Bass Enable Q274 when B.W. Bass tab is on.
3) Positive voltage is applied to the base of Q280 Magic Chord tab "on" switcher. This turns on Q280 and disables the Lower Keyboard A1-A2 keyswitch by grounding the keying voltage through Diodes D174-D186.

   When Q280 turns on, it also causes Q281 Serial Data Switcher to turn off, allowing the Serial Data from Pin 23 of the CFG to pass to Magic Genie AOC and 4-foot Decoder IC99.
4) Positive voltage is applied to Pin 8 of IC87D Magic Chord Enable locking its output Pin 10, high. This blocks the negative transition of the X line at Pin 29 from the Y line of Pin 21 and puts the CFG in the chord mode of operation.

Pressing a Magic Chord keyswitch (A1-G#2) at this time causes data bits to appear at three CFG time points. These data bits provide the address code for the programmable frequency generators, causing three audio frequencies that form a specific chord to be outputted at Pin 5 of the CFG. These audio signals are then applied to the Magic Chord Preamp Q277 where they are amplified and routed to the Lower Keyboard 8-foot Filter circuits. Magic Chord Squelcher Q279 has positive voltage applied to its base from the Magic Genie AOC Decoder each time a Lower Keyboard key is pressed, turning on Q279 which turns off Q278 and ungrounds the Magic Chord output. With no lower keys held, Q278 grounds the Magic Chord output preventing any leakage that might occur.

NOTE: In the Magic Chord Mode of Operation, only the highest chord being played will sound.

MAGIC GENIE AOC

With the Magic Chord tab on, holding down a chord keyswitch outputs information on the Serial Data stream (Pin 23 of the CFG) which corresponds to the chord being played. Under these conditions, Serial Data Switcher Q281 is turned off through Magic Chord "On" Switcher Q280, and the Serial Data information passes through Inverter Q282 to the input Pin 3 of the Magic Genie Flute AOC and 4-foot Decoder IC99. The output Pin 6 of IC93B (approximately 250 KHz) is applied to IC95A&B where it is frequency divided by four and routed to the Clock Input Pin 2 of IC99. The Serial Data Information is transferred into IC99 with each clock pulse at Pin 2. At time point 72 (at the end of the CFG Scan) a sync pulse occurs at Pin 22 of the CFG. The sync pulse clocks Pin 3 of IC94A causing the Q output to go high, holding the D input of IC94B high. When the next clock pulse occurs at Pin 11 of IC94B, the Q output at Pin 8 will go low resetting dividers IC95A&B and transferring the AOC information out of IC99. If for instance a C Magic Chord was being held this would result in a positive voltage on the C, E & G lines or Pins 14, 18 & 21 of IC99. This positive voltage is then routed to the AOC drivers. From this point, the AOC operates as described under the Schematic 13 heading.

MAGIC GENIE 4-FOOT TOS

Audio signal from the Chord Function Master Oscillator is divided-by-three by IC96A&B producing a signal of approximately 166 KHz at Pin 9 of IC96B. This signal is applied to Pin 2 of IC97 and IC98 where it is divided simultaneously producing twelve specific audio frequencies. These frequencies are used for the Lower Keyboard 4-foot voices when the CFG is in the chord mode of operation. Serial data information corresponding to the Magic Chord being held is clocked into Magic Genie AOC and 4-foot Decoder IC99.

At the end of the CFG scan (time point 72), a sync pulse from IC85 is transferred through IC94A&B and applied to Pin 37 of IC99. The negative edge of this pulse transfers the chord information out of IC99 which results in a positive voltage at the anodes of three diodes D371. The diodes are forward biased allowing three audio signals that form a specific chord to pass to the lower keyboard 4-foot filtering circuits.

CHORD HOLD ENABLE

With the Chord Hold tab off, Pin 12 of IC87C is held low. This causes the output of IC87C at Pin 11 to follow the X line from Pin 28 of the CFG. This in effect connects the X Scan Line at Pin 28 to the Y Scan Line at Pin 21 and is the condition of the CFG chip when the Chord Hold feature is not operating. Turning on the Chord Hold tabswitch locks the output of IC87C high, disconnecting the X and Y Scan Line which puts the CFG in the Chord Hold Mode. In this mode of operation, all Magic Genie functions will continue to be outputted after all Lower Keyboard keys are released.

7TH ENABLE

With the Magic Chord tab on, positive voltage from Q272 is applied to the base of Q271 turning it on. This connects the X output on Pin 26 of the CFG to the Y line at Pin 21 and activates the 7th time point of the CFG. This is the condition of the CFG when the 7th of the chord is not being played. To enable the 7th to play, Pin 26 and Pin 21 must be momentarily disconnected. This is accomplished by the following: Pressing the A2 keyswitch applies a positive voltage to the base of Q272, turning it on which removes positive voltage from the base of Q271 and turns it off. When Q271 turns off, the X and Y lines are disconnected, deactivating the 7th time point which adds the 7th component to the Magic Chord being played.

MINOR ENABLE

When the minor of the chord is not being played, Minor Enable Q273 is held on which holds Pin 2 of IC87B low. With Pin 2 of IC87B held low, its output at Pin 3 will follow the X line from Pin 27 of the CFG. This in effect connects the X line at Pin 27 to the Y line at Pin 21 and is the condition of the CFG when the minor is not being played. To enable the minor to play, Pin 27 and Pin 21 must be momentarily disconnected. This is accomplished by the following: activating the minor switch (located to the right on the expression shoe) lowers the voltage on the base of Q273 turning it off. This causes Pin 2 of IC87B to go high, which in turn locks its output Pin 3 high. With Pin 3 held high, the negative transition of the X line at Pin 27 of the CFG is not passed to the Y line at Pin 21. This deactivates the CFG time point for the minor, changing the Magic Genie chord being played to a Minor chord.

STRUM

STRUM ENABLE

Holding a chord keyswitch with the Magic Chord tabswitch on, outputs the frequencies of the chord being played on the four strum signal lines Pin 1, 2, 3 and 40. If the Ukulele tab is on, the X line at Pin 32 of the CFG is connected through the Ukulele Strum Enable Gate IC86D to the Y line at Pin 21 and the frequencies outputted on the signal lines will be one octave higher. Each time a pulse occurs at Pin 15 of the CFG from the Strum Trigger Q291, a sequence of keyer pulses are generated and outputted on the four Strum Keying Lines, Pins 8, 9 10 and 11. The frequency of this sequence of keyer pulses is determined by the RC network on Pin 14 of the CFG. The first keyer pulse appears on the Root Keying Line, then the 3rd, 5th and 7th. If the 7th of the chord is not enabled (see 7th Enable), the sequence will not include a pulse on Pin 8 for the Strum 7th signal. The pulses on the four keying lines are applied to the anodes of Diodes D357, D360, D363 & D366 turning them on, allowing audio signal on the four strum signal lines to pass to the Strum Preamp Q276. Here the signal is amplified and routed via either the Guitar or Ukulele Strum tabs to various voicing circuits.

STRUM TRIGGER

Turning on the Swing, Dixie, Shuffle, Swing Waltz, Waltz or Swing March rhythm switch applies a positive voltage to the base of Q284, turning it on. This lowers the voltage on the base of Q285 which turns off. When Q285 turns off, it applies a positive voltage to Pin 1 of Strum Trigger Gate IC92B. With Pin 1 of IC92B held high, it acts as an inverter and its output at Pin 3 will be the inverted input applied to Pin 2. The input at Pin 2 can come from the ROM IC103 Pin 22 or Pin 23 or from the Boogie Bass Trigger gates, depending on the position of the Strum/Upbeat/Downbeat tab and the Boogie Bass tab. The output of IC92C can be considered high, so when Pin 3 of IC92B goes high a negative pulse results at Pin 8 of IC92D, momentarily lowering the voltage on the base of Q291 turning it off. When Q291 turns off, its collector applies a positive pulse to Pin 15 of the CFG IC85 triggering the strum sequence. For the above-mentioned rhythms, the strum sequence will occur with the Accompaniment pulse when the Strum tab in the Upbeat position, and with the bass pulse in the Downbeat position (Boogie or High/Low Bass, depending on the position of the Boogie Bass tab). Using any rhythm except the above-mentioned causes the following: Q284 is off, which applies a positive voltage to the base of Q285. This turns Q285 on, holding Pin 1 of IC92B in a low state. With Pin 1 of IC92B held low, its input at Pin 2 has no effect and its output at Pin 3 is locked high. The high output from Pin 3 is applied to Pin 4 and 10 of IC92 causing these gates to act as inverters. The Trigger Pulse at the output of IC92D will follow the negative transition of the counter output from IC102 Pin 12. Putting the Strum tab in the downbeat position inverts the output from Pin 12 through IC92A. The trigger output at Pin 8 of IC92A will now follow the positive transition of the counter output from Pin 12. For the specific time point where the strum sequence occurs for each rhythm, see the Rhythm Patterns Diagram in the Chart Section of this manual.

ARPEGGIO

ARPEGGIO ENABLE

The X line at Pin 25 of the CFG is not connected to the Y line at Pin 21 of the CFG. This enables the internal CFG Arpeggio Shift Register. Pulses are applied to the shift register from one side of the internal Arpeggio Clock Oscillator. The shift register advances with every other transition of the clock and generates a keying pulse which appears on Pin 13 of the CFG. The clock is triggered from the Arpeggio triggers through Pin 12 of the CFG. The shift register also addresses a multiplexer which has as its input 3 octaves of root, 3rd and 5th frequencies of the Magic Chord being played. The output of the multiplexer passes through some gating and appears on the arpeggio signal line, Pin 39 of the CFG. A different frequency is outputted on Pin 39 each time the shift register advances. When the keyer pulse is present on Pin 13, D354 is turned on allowing the audio signal on Pin 39 to pass to the Arpeggio Preamp Q275. Here the signal is amplified and routed through the Piano or Harpsichord Arpeggio tab to the Piano Filter or Harpsichord Filter.

ARPEGGIO TRIGGER

Turning on the Swing, Dixie, Shuffle, Swing Waltz, Waltz or Swing March rhythm switch applies a positive voltage to the base of Gate Selector Q284, turning on Q284 which in turn switches Q285 off. With Q284 on, Pin 12 of IC91B is held low, disabling this gate. With Q285 off, Pin 8 of IC91A is held high, causing this gate to act as an inverter. The input at Pin 9 of IC91A is the delayed strobe pulse. When the positive strobe pulse occurs, Pin 10 of IC91A goes low applying an arpeggio trigger pulse to Pin 12 of the CFG. If a rhythm is being used that is not mentioned above, IC91A will be disabled and IC91B will act as an inverter due to the condition of Q284 & Q285 and the off condition of the above-mentioned rhythms. The input on Pin 13 of IC91B is the delayed strobe pulse which has been frequency divided-by-two through Gate IC88A. When the strobe pulse occurs, Pin 11 of IC91B goes low applying an arpeggio trigger pulse to Pin 12 of the CFG. Because of the nature of the Arpeggio Clock (see Arpeggio Enable), the frequency of the keyer pulse at Pin 13 of the CFG will be half that of the frequency of the trigger pulse applied to Pin 12.

HIGH/LOW BASS

With the Magic Genie Chord tabswitch off, the only feature of the CFG chip that is outputted is the High/Low Bass. In this mode of operation, holding down two or more lower keyboard keyswitches (A1-C4) causes the following: Audio signal corresponding to the lowest note being played is outputted from Pin 7 of the CFG and the highest note is outputted from Pin 6. These signals are routed through High/Low bass select circuits to the base of Q183 Divider Driver (see Schematic 11). With no rhythm on, positive voltage from the Rhythm Start tabs is applied to the select circuits allowing only low bass signal to pass to Q183.

ROOT/FIFTH BASS

With the Magic Genie Chord tabswitch on, the bass feature of the chip is in the Root/Fifth mode of operation. If a Magic Genie Chord (one-note chord) is held at this time, the audio signals at the bass root output (Pin 7) and bass 5th output (Pin 6) are the root and 5th components of the chord being played. These signals are routed through High/Low bass select circuits to the base of Q183 Divider Driver (see Schematic 11). With no rhythm on, positive voltage from the rhythm start tabs is applied to the select circuits allowing only the root bass signal to pass to Q183.

BOOGIE WOOGIE BASS

BOOGIE WOOGIE BASS ENABLE

Turning on the Boogie Woogie Bass tab with the Magic Chord tab on, allows positive voltage to pass through Diode D339 to the Low Bass Selectors Q181 and Q182 and also through Diode D338 to the base of Q274. The voltage applied to the bass selectors holds the signal path for the Low Bass signal on. (In the Boogie Woogie Bass mode, audio signal is only outputted from Pin 7 of the CFG.) The voltage applied to the base of Q274 turns Q274 on. This holds Pin 6 of IC86B low and also resets the Boogie Woogie Bass shift register through Pin 6 of the CFG. With Pin 6 of IC86B held low, its output at Pin 4 follows the X Scan Line from Pin 30 of the CFG. This puts the CFG bass feature in the Boogie Woogie mode.

Under the above conditions with a rhythm on (see Any Rhythm On Gate IC86C), 5 signals are multiplexed to the bass Low/Root output, Pin 7 of the CFG. The multiplexer is controlled by a shift register. Each time a trigger pulse is applied to Pin 37 of the CFG from the Boogie Bass Triggers, the shift register advances one position and outputs the next signal in the bass sequence. The signal is outputted at Pin 7 of the CFG, then routed through the Low Bass Selectors to the base of Divider Driver Q183. If a keydown occurs before the bass sequence is complete, the shift register will reset to the starting point.

BOOGIE WOOGIE BASS TRIGGER

Turning on the Swing, Dixie, Shuffle, Swing Waltz, Waltz or Swing March rhythm switch applies a positive voltage to the base of Gate Selector Q284. This causes Q284 to turn on which in turn causes Q285 to turn off. With Q284 on, Pin 5 of IC91D is held low, disabling this gate. With Q285 off, Pin 1 of IC91C is held high causing this gate to act as an inverter. The input at Pin 2 of IC91C originates at Pin 11 of IC89A. The output from the clock multivibrator is applied to Pin 11 of IC89A where it is frequency divided-by-two; output is applied as input to IC89B. IC89B, IC90A and 90B comprise a divide-by-three divider with the output at Pin 5 of IC90B. The input at Pin 1 of IC88B is the strobe pulse. This causes the output at Pin 3 of IC88B to have a pulse width equal to the strobe pulse and a frequency which is the Counter input frequency (Pin 7 IC102) divided-by-three. When Pin 3 of IC88B goes high, a negative pulse results at the output Pin 3 of IC91C (since IC91C acts as an inverter) lowering the voltage on the base of Q290 and turning it off. This applies a positive Boogie Woogie advance pulse to Pin 37 of the CFG. Q289 holds Q290 off momentarily which increases the pulse width of the trigger pulse. At the end of the rhythm measure a negative reset pulse is applied to the Boogie Bass Pulse Dividers, setting the output Pin 5 of IC90B high.

If any but the above rhythms are on, Gate IC91C will be disabled and IC91D will act as an inverter due to the state of Q284 & Q285 and the off condition of the above-mentioned rhythms. The input at Pin 6 of IC91D originates at Pins 12 & 13 of IC88D. The input at Pin 12 of IC88D is the counter input frequency (Pin 10 of IC102) divided-by-two and the input at Pin 13 is the counter input frequency divided-by-four. This causes the output at Pin 11 to be the frequency of the

Pin 13 input, having a pulse width equal to the Pin 12 input. This output is then applied to Pin 9 of Gate IC88C, the input at Pin 8 of IC88C is the strobe pulse, the output at Pin 10 will be the strobe pulse at the divided-by-four counter input frequency. When Pin 10 of IC88C goes high, a negative pulse results at the output Pin 4 of IC91D (since IC91D acts as an inverter). This pulse is applied to the base of Q290 which operates as described above. The output from Pin 9 of IC89A also drives the Golden Harp when a rhythm and rhythm sync switch are on.

Q283 RHYTHM & INTRO ON SWITCHER

With no rhythms on, positive voltage from the anode of D379 (see Drawing 15) is applied to the base of Q283 holding it on. Switching on a rhythm lowers the voltage on the base of Q283 through Rhythm Start Switcher Q128 (see Schematic 7). This causes Q283 to turn off applying a positive voltage to the Any Rhythm On Gate IC86C, the Rhythm On Vibrato Killer Q286 and the Strum Trigger Disable Q288. Q283 also performs two functions related to the Golden Harp: 1) Each time the rhythm switches off, a negative reset pulse is applied to Pin 13 of IC89A through D345. This sets the Q output low, and 2) Q283 grounds the "on" of a rhythm sync switch contact. This makes it possible for the Golden Harp to operate from the Harp speed oscillator if the sync switch happens to be on without a rhythm on. With the rhythm off, the base of Genie Accompaniment Switcher Q127 is held low turning off Q127 and applying a steady DC to the Accompaniment Modulator. (See Schematic 7.)

Pressing the Intro switch applies positive voltage to three CFG circuits: 1) through Diode D343 to the base of Q283. This turns Q283 on, disabling the Strum Trigger; 2) through Diode D344 to Pin 13 of IC89A. This prevents IC89A from becoming disabled when Q283 turns on for Intro, and 3) through Diode D348 to the bases of Q284 & Q285, turning them on, disabling the Arpeggio and Boogie Bass Trigger Gates.

IC86C ANY-RHYTHM-ON GATE

With no rhythm on, Pin 2 of IC86C is held low by the on condition of Q283. This allows the X Scan output from Pin 31 of the CFG to pass to the Y Scan Line at Pin 21. Under this condition the internal Boogie Woogie Bass multiplexer is locked in the root position and outputs the Low/Root note from Pin 7 of the CFG. With a rhythm on, the collector of Q283 goes high disabling IC86C blocking the X Scan output from the Y scan. This tells the multiplexer a rhythm has been switched on allowing it to advance with each Boogie Bass Trigger pulse applied to Pin 37.

Q286 RHYTHM ON VIBRATO KILLER

With a rhythm on, the collector of Q283 Rhythm and Intro On Switcher goes positive. This positive voltage is applied to the base of Q286 turning it on. When Q286 turns on, it grounds the output from the vibrato oscillator preventing it from reaching the Chord Function Master Oscillator Q287. This cancels the vibrato effect on the Magic Genie features when a rhythm is on.

Q288 STRUM TRIGGER DISABLE

Pressing the Intro tab turns on Q283 Rhythm and Intro On Switcher, which removes positive voltage from the base of Q288 turning it off. When Q288 turns off, it removes the voltage at the collector of the Strum Trigger Q291 disabling Q291, cancelling Strum for the duration of the Intro Set.

IC93A BOOGIE INTRO RESET

After the Intro Set there is a one clock pulse-delay before the rhythm restarts. The Boogie Intro Reset blocks this pulse from Triggering the Boogie Bass Trigger so the rhythm and bass sequence start together on the second clock pulse after Intro. This is accomplished by the following: Pushing the Intro tab turns on Q283. This puts a low on Pin 13 of IC93A which locks the output Pin 8 high. When the first clock pulse occurs after Intro, the output of the Boogie Trigger Gates will go low but the Boogie Bass Trigger Q290 does not feel this negative transition because Pin 8 of IC93A is still held in a high state. When the output of the Boogie Bass Trigger Gate is making a positive transition IC93A clocks and the Q output from Pin 8 locks in a low state. On the next clock pulse, the Boogie Bass Trigger Gate goes low and is now able to turn on Q290 and trigger the Bass Advance input of the CFG.

SCHEMATIC 15

AUTOMATIC RHYTHM

The Clock Multivibrator oscillates, producing a square wave output at the collector of Q297. This output is applied to the strobe delay transistor and through Divide-by-two D Flip-Flop IC89A to the Resetable Counter. The Resetable Counter divides the input from IC89A by two, between Pins 10 & 11, 11 & 12, 12 & 13 and 13 & 14. The combined outputs of Pins 10 - 14 are applied to Brush Decoder circuits, which determine the brush length of some rhythms and also to Pins 35 - 39 of the Read Only Memory (ROM). Within the ROM, the combined inputs from the counter are decoded which results in a positive voltage appearing on one of the 32 internal decoder lines. As the combined inputs from the counter change, this positive voltage shifts in succession from the 1st through the 32nd decoder line, giving 32 possible rhythm timing points. (In the case of triplet or waltz rhythms, the counter is reset before counting through 32 points.) The Decoder Lines then connect through gating circuits to matrix circuits. Turning on a Rhythm Selector switch connects the strobe pulse to the ROM. The strobe pulse enables the gating circuit for the rhythm chosen. This allows the voltage on the decoder line, that is positive at this time, to pass through the matrix where it is inverted and routed out of the ROM to the correct instrumentation circuit for that timing point and rhythm. The instrumentation circuits produce the rhythm voice which is then amplified and applied to the rhythm output amp.

Q295 MULTI-STARTER

Pressing the start tabswitch (or pressing a lower keyboard key with the Rhythm Start tab in the auto position) lowers the voltage on the base of the multi-starter Q295. Lowering the voltage at this point performs two functions: 1) A pulse is created across the .05 capacitors applying a negative pulse to Pins 3, 5 and 6 of the Resetable Counter, thereby resetting the counter to timing point 1 (Pins 10-14 will be positive at this time) and 2) Multi-Starter Q295 turns on, supplying voltage to the Clock Multi-Vibrator Transistor Q297, enabling the clock to run.

Q297, Q298 CLOCK MULTI-VIBRATOR

A positive voltage from the Multi-Starter is applied to the Clock Multi-vibrator which enables it to run. The Clock runs continuously producing a square wave output at the collector of Q297. The positive edge of this output triggers the Boogie Bass Pulse Dividers IC89A and the resetable counter and the negative edge triggers the strobe delay transistor. The tempo at which the clock runs is controlled by the rhythm tempo control and various slow down circuits.

RHYTHM STROBE PULSE

The rhythm strobe pulse is developed at the collector of the Rhythm Strobe Keyer Q329. Selecting a rhythm connects this pulse to the ROM where it enables the 32 ROM decoder lines, allowing them to trigger the instrumentation circuits. The strobe pulse is slightly delayed in relation to the ROM decoder outputs. This allows the decoder functions to stabilize before the strobe pulse enables their output.

Q325, IC88A & Q292 STROBE DELAY, GATE & DRIVER

When the output of Clock Transistor Q297 is low, a negative pulse is created across the .01 capacitor at the base of Q325. This lowers the voltage on the base of Q325 turning it off, creating an output pulse at its collector that is one clock pulse delayed. This pulse is then routed to Pin 6 of Strobe Gate IC88A (shown on Drawing 14.) The other input to IC88A on Pin 5 is the divided-by-two clock frequency. The output of IC88A will be the pulse width of the strobe pulse at the frequency of the divide-by-two clock. When the output of IC88A is high, Q292 is turned on momentarily lowering the base voltage of the Strobe Keyer (Q324, Q327, Q329) that is in operation at the time.

Q329 RHYTHM STROBE KEYER

With the Intro off, the emitter and base of Q329 are positive. When Q292 conducts, it momentarily lowers the base voltage on Q329 causing it to turn on. This develops a positive output pulse at the collector of Q329. Turning on a rhythm selector switch connects this pulse to the ROM input for the rhythm selected. This pulse is routed to the gating circuit for that rhythm and allows the output from the ROM decoder to pass to the rhythm matrix, where the instrumentation circuits for that timing point are selected.

IC102 RESETABLE COUNTER

The Resetable Counter is a five-stage divide-by-two divider, the output of each stage connected to the input of the next. The 1st through 5th divider outputs are Pins 10 through 14, respectively. Applying a negative pulse to Pins 3, 5 and 6 resets the counter to timing point 1 (at this time all five outputs are positive). The five outputs are applied as input to the ROM and are also used to trigger the reset, brush decoder, strum and boogie bass circuits.

IC103 READ ONLY MEMORY [ROM]

The five inputs from the Resetable Counter are applied to the ROM. These inputs are decoded which results in a positive voltage appearing on one of the 32 internal decoder lines. There is a separate matrix for each rhythm pattern and each matrix has a gating circuit between it and the 32 decoder lines. Turning on a rhythm switch connects the strobe pulse to the gating circuit for the rhythm selected. The strobe pulse enables the gating circuit and allows the voltage on the positive decoder line to pass to the matrix. Here the voltage is inverted and routed to the instrumentation circuits for that timing point and rhythm. As the inputs to the ROM change, the positive voltage counts down the 32 decoder lines one at a time and each time it is pulsed through the matrix by the strobe pulse. This creates the 32 timing points for the rhythm.

Q299 RESET INVERTER

The Reset Inverter has positive voltage pulses applied to its base from the Waltz Reset Line, the Intro End Rhythm Reset Line, the Intro Resetable Counter Reset Line and the Intro Hold Reset. Each time a positive pulse is applied to the base of Q299, it conducts creating a pulse across the .01 capacitors at the anodes of D380 and D381. This momentarily removes the positive voltage on Pins 3, 5 and 6 of the Counter IC102, which resets the counter to the first rhythm timing point. At this time Pins 10-14 are positive.

TRIPLET TIMING

The Ballad, Swing March, Dixie, Swing and Shuffle rhythms are triplet timing rhythms. This means that they only use 24 of the available 32 rhythm timing points. The purpose of the triplet circuitry is to reset the counter to the first timing point after 24 timing points and also to slow down the clock multi-vibrator.

Q313, Q314 TRIPLET, CLOCK SLOW DOWN SWITCHER & RESET ENABLE, TRIPLE RESET

Turning on the Ballad, Swing March, Dixie, Swing or Shuffle rhythm selector switch applies a ground to the Triplet Enable Line. This lowers the voltage on the base of Q313, turning it on. When Q313 turns on, it applies a positive voltage to two places: 1) Through Diode D395 and a 10K resistor to the clock slow down line and 2) Through Diode D396 to the collector of Q314. Q314 is normally held on by a positive voltage through Diodes D397, D398 or D399. When the 24th timing pulse is reached, the outputs of the counter which are connected to these diodes will all be low. This causes Q314 to turn off, allowing its collector to go positive. On the next clock pulse a positive voltage is applied to the base of Q314 turning it on. This creates a negative pulse on Pins 5 and 6 of the counter and resets all the counter outputs to positive or back to the first timing point.

Q311 SWING MARCH, CLOCK SLOW DOWN SWITCHER

Turning on the Swing March, triplet rhythm applies a ground to the Swing March slow down line. This lowers the voltage on Q311 causing it to turn on. When Q311 turns on, it applies a positive voltage to the clock slow down line. This voltage is higher than the voltage applied to the clock from Q313 and causes the clock to run slower for the Swing March rhythm.

WALTZ TIMING

The Waltz and Swing Waltz rhythms are three quarter time rhythms. This means that they only use 18 of the available 32 rhythm timing points. The purpose of the waltz circuitry is to reset the counter to the first timing point after 18 timing points and also to slow down the clock multi-vibrator.

Q316, Q317 WALTZ CLOCK SLOW DOWN SWITCHER & RESET ENABLE, WALTZ RESET

Turning on the Waltz or Swing Waltz rhythm selector switches applies a ground to the Waltz enable line. This lowers the voltage on the base of Q316, turning it on. When Q316 turns on, it applies a positive voltage to two places: 1) Through Diode D401 and a 10K resistor to the clock slow down line and 2) Through Diode D402 to the collector of Q317. Q317 is normally held on by a positive voltage through Diode D404 or D405. When the 18th timing pulse is reached, the outputs of the counter that are connected to these diodes will all be low. This turns Q317 off, allowing its collector to go positive. This positive voltage is applied as a pulse to the base of the Reset Inverter, Turning it on which applies a negative pulse to Pins 3, 5 and 6 of the counter. This resets all the counter outputs to positive or back to the first timing point.

BRUSH LENGTH CONTROL

[See Brush Keying]

The length of the brush voice for each rhythm (except for the Waltz, Swing March, Swing and Rock I rhythms, which do not use the brush voice) is regulated by varying the discharge rate of the .27 uf capacitor at the base of the Brush Keyer Q342. (See Schematic 16.) Turning on one of these rhythm selector switches connects a resistor to ground from the "on" of the selector switch to the Brush Length Control Line. The value of the resistance regulates the discharge rate of the .27 uf capacitor, thereby regulating the length of the brush voice. The length of the brush voice for some of these rhythms varies at different timing points. Turning on one of these rhythms enables a decoder circuit, which will allow a positive voltage to reach the base of the Brush Length Regulator Q305 at certain timing points. These pulses turn on the Brush Length Regulator adding a 150K resistor to ground to the brush length control line. This causes the .27 uf capacitor to discharge faster, giving a shorter brush voice for the timing point when Q305 is on.

NOTE: The 150K resistor added to ground by the Brush Length Regulator parallels the resistance to ground from the "on" of the rhythm selected. This means there is less resistance to ground when Q305 is turned on, causing the .27 uf capacitor to discharge faster.

Q301, Q302 & Q304 ROCK II & ROCK III BRUSH DECODER ENABLERS & BRUSH DECODER

Turning on the Rock II or III Rhythm Selector Switches 1) connects a 470K resistor to ground through Diodes D434 or D435 and, 2) applies a positive voltage through Diodes D429 or D430 to the base of Q302. This positive voltage turns on Q302 removing positive voltage from the base of Q301 which now turns off and ungrounds the outputs of Diodes D387 and D388. Each time Pin 12 of the Counter IC102 goes high, a positive voltage will be applied through D387 to the base of Q305. Positive voltage will only be applied to the base of Q305 from D388 when Pin 13 of IC102 is high and Pin 11 is low. When Pin 11 is low, the Rock II and III Brush Decoder Q304 turns off and allows any positive voltage on Pin 13 to pass through D388 to the base of Q305. Positive voltage applied through D387 or D388 to the base of Q305 turns Q305 on which connects a 150K resistor in parallel with the 470K resistor to ground from the Brush Length Control Line. This causes the .27 uf capacitor at the base of the Brush Keyer Q342 to discharge faster giving a shorter brush length at the timing points when Q305 is on.

Q303 SAMBA, BOSA NOVA & LATIN ROCK BRUSH DECODER

Turning on the Samba, Bosa Nova or Latin Rock rhythm selector switches connects a 470K resistor to ground from the Brush Length Control Line and also allows positive voltage to pass through Diode D431, D432 or D433 to the collector of Q303. If Pin 12 of the Counter IC102 is low, Q303 is off and this positive voltage will pass through D385 to the base of Q305. If Pin 12 of IC102 is high, Q303 will turn on and ground the path through D385 to the base of Q305. Positive voltage applied through D385 to the base of Q305 turns Q305 on which connects a 150K resistor in parallel with the 470K resistor to ground from the Brush Length Control Line. This causes the .27 uf capacitor, at the base of the Brush Keyer Q342, to discharge faster giving a shorter brush length at the timing points when Q305 is on.

Q306 MARCH POLKA BRUSH DECODER

Turning on the March Polka Rhythm Selector Switch connects a 1M resistor to ground from the Brush Length Control Line and also allows positive voltage to pass through to the collector of Q306. If Pin 25 of the ROM IC103 is low, Q306 will be off and this positive voltage will pass through D386 to the base of Q305. If Pin 25 of IC103 is high, Q306 will turn on and ground the path through D386 to the base of Q305. Positive voltage applied through D386 to the base of Q305 turns Q305 on which connects a 150K resistor in parallel with the 1M resistor to ground from the Brush Length Control Line. This causes the .27 uf capacitor, at the base of the Brush Keyer Q342, to discharge faster giving a shorter brush length at the timing points when Q305 is on.

Q305 BRUSH LENGTH REGULATOR

This transistor is only enabled when a rhythm having more than one brush length is on. It is turned on from several decoder circuits depending on the rhythm selected. When Q305 turns on, it connects a 150K resistor to ground from the Brush Length Control Line. This shortens the discharge time of the .27 uf capacitor at the base of the Brush Keyer Q342, thereby creating a shorter brush length.

CYMBAL LENGTH CONTROL
[See Cymbal Keying]

The rhythms using the Cymbal voice are Ballad, Swing March, Waltz, Rock I, II and III, Samba, Swing, Dixie and Bosa Nova. The length of the Cymbal voice for these rhythms is regulated by varying the discharge rate of the .27 uf capacitor at the base of the Cymbal Keyer Q345. Turning on one of these rhythm selector switches, except Waltz, Dixie or Swing, connects a resistor to ground from the on of the selector switch to the Cymbal length control line. The value of resistance regulates the discharge rate of the .27 uf capacitor thereby regulating the length of the Cymbal voice. (The Waltz rhythm has a long Cymbal voice and no resistor is connected to ground from the Cymbal length control line when this rhythm is turned on). The length of the Cymbal voice for Dixie and Swing is regulated by the Dixie and Swing Cymbal length regulator. Turning on one of these rhythms enables the Dixie and Swing Cymbal decoder which will allow a positive voltage to reach the base of the Cymbal Length Regulator Q308, connecting a 150K resistor to ground from the Cymbal Length Control Line. This causes the .27 uf capacitor to discharge faster giving a shorter Cymbal voice for the timing point when Q308 is on.

Q307, Q308 DIXIE, SWING CYMBAL DECODER & LENGTH REGULATOR

Turning on the Dixie or Swing rhythm allows positive voltage to pass through Diode D346 or D347 (shown on Drawing 14) to the collector of Q307. If Pin 25 of the ROM IC103 is low, this positive voltage passes to the base of Q308 and turns it on. When Q308 turns on, it connects a 150K resistor from the Cymbal length control line to ground. This causes the .27 uf capacitor at the base of the Cymbal Keyer Q345 to discharge faster, thereby giving a shorter Cymbal length when Q308 is on. When Pin 25 of IC103 is high, Q307 turns on and grounds the base of Q308, turning it off.

Q309, Q310 GENIE MODULATOR KEYER & DRIVER

Turning on the rhythm allows Q309 to be turned on by negative pulses from Pin 23 of IC103. When Pin 23 of IC103 goes low, Q309 conducts and charges the .27 uf capacitor at the base of Q310. When Q309 turns off, this capacitor discharges onto the base of Q310 and turns it on. This applies a positive voltage pulse to Pin 5 of IC55 and gates the input signal through IC55 for the duration of the discharge time. The discharge time of the .27 uf capacitor is controlled by the state of IC103 Pin 25. If Pin 25 is high, the .27 uf capacitor will discharge slowly, holding Q310 on longer thereby creating a long signal pulse. If Pin 25 is low, the .27 uf capacitor will discharge faster through Diode D349 holding Q310 on only for a short time, creating a short signal pulse.

INTRO

The Intro switch is a momentary switch which activates the Intro Latch circuit. With the Intro Latch on, positive voltage appears at the collector of Q322. This voltage disables the rhythm strobe and also (depending on the rhythm selected) enables either the Intro 1 or 2 Strobe Keyer. The outputs of the Intro 1 and 2 Strobe Keyers are connected to the ROM where they perform the same function as the rhythm strobe - (see Circuit Description for Rhythm Strobe). Turning on the Waltz or Swing Waltz rhythm selector switches removes the positive voltage from the "on" of the Intro switch by applying a ground via the Intro disable line. This disables the Intro on these two rhythms.

Q319, Q320 INTRO LATCH

Pressing the Intro switch momentarily applies a positive voltage to the base of Q320 turning it on. When Q320 turns on, it lowers the voltage on the base of Q319. This causes Q319 to turn on which reapplies voltage to the base of Q320 and holds it on. These two transistors remain latched in this manner for the duration of the Intro set. With Q320 held on, a positive voltage is applied to the base of the Intro Switcher Q321, and also to the bases of Q283, Q284 and Q285 disabling the Strum, Arpeggio and Boogie Bass Triggers (see Drawing 14).

Q321 INTRO SWITCHER

Positive voltage from Q320 is applied to the base of Q321 causing Q321 to turn on. When Q321 turns on, it performs two functions: 1) It lowers the voltage on the base of the Intro Enable Q322 turning it on, and 2) It momentarily lowers the voltage on the base of the Intro Reset Q296, via the Intro Clock Reset Line, and turns it on. At the end of the Intro set, the collector of Q321 goes positive and applies a positive pulse through Diode D406 to the base of the Reset Inverter Q299. This causes Q299 to conduct which applies a negative pulse to Pins 3, 5 and 6 of the counter. This resets the counter and insures that the rhythm will start at the first timing point.

Q296 INTRO RESET

The voltage on the base of Q296 is lowered when the Intro Switcher Q321 turns on. This causes Q296 to momentarily conduct bypassing Clock Transistor Q297 and resetting the collector of Q297 to a positive output for the start of the Intro.

Q322 INTRO ENABLE

When the Intro Switcher Q321 conducts, the voltage on the base of Q322 is lowered, causing it to turn on. When Q322 turns on, it performs four functions: 1) It provides the voltage supply for the Intro 1 and 2 Strobe Enable circuits; 2) It applies voltage to the base of Q300, lighting the Intro Lamp; 3) It applies a positive pulse through Diode D407 to the base of Q299, causing Q299 to conduct. This creates a negative pulse on Pins 3, 5 and 6 of the Counter IC102 resetting the counter for positive output for the start of the Intro, and 4) It neutralizes the 10K load through Diode D413, causing the voltage to rise on the base of the Rhythm Strobe Disable Q328.

Q328 RHYTHM STROBE DISABLE

When the Intro Enable Q322 conducts, it applies positive voltage through Diode D413 which neutralizes the 10K load there. This causes the voltage to rise on the base of Q328 which turns it off. When Q328 turns off, it removes the voltage supply to the Rhythm Strobe Transistor Q329, disabling the rhythm strobe pulse.

Q326, Q327 INTRO 1 STROBE ENABLE & STROBE KEYER

The Intro 1 strobe is used for Intro on all rhythms except triplet rhythms. With a rhythm on that is not a triplet, the positive voltage from the Intro Enable Q322 is applied to the base and emitter of Q326. The base voltage will be lower because of the 10K load through Diode D418 and Q326 will conduct and supply positive voltage to two places: 1) Through Diode D420 and a 3.3K resistor to the Clock

Multi-vibrator. This slows down the clock for the Intro set and 2) Through Diode D421 to the emitter and base of the Intro 1 Strobe Keyer. Each time the output from the Strobe Driver Q292 is low, Q327 will conduct, producing a strobe pulse at its collector. This pulse is then connected to Pin 13 of the ROM and performs the same function as the rhythm strobe. (See Rhythm Strobe circuit description.)

Q323, Q324 INTRO 2 STROBE ENABLE AND STROBE KEYER

The Intro 2 strobe is used for Intro on triplet rhythms. With a triplet rhythm on, ground is applied to Diode D415 via the triplet enable line. This causes the voltage from the Intro Enable Q322 to be applied to the base and emitter of the Intro Strobe Enable Q323. The base voltage will be less than the emitter voltage and Q324 will turn on and apply positive voltage to three places: 1) Through Diode D417, neutralizing the 10K load there and preventing a voltage drop on the base of Q326 which keeps Q326 from conducting, thereby disabling the Intro 1 Strobe; 2) Through Diode D416 to the emitter of the Ballad, Intro Clock Slow Down Switcher Q312 and 3) To the emitter and base of the Intro 2 Strobe Keyer. Each time the output from the Strobe Driver Q276 is low, Q324 will conduct, producing a strobe pulse at its collector. This pulse is then connected to Pin 14 of the ROM and performs the same function as the rhythm strobe. (See Rhythm Strobe circuit description.)

Q312 BALLAD, INTRO CLOCK SLOW DOWN SWITCHER

This transistor is only used when the Ballad Rhythm is on and the Intro tab is activated. Positive voltage is supplied to the emitter of this transistor from Q323 through Diode D416. With the Ballad rhythm selector switch on, ground is applied to Q312's base via the Ballad Intro Slow Down Enable Line. This lowers the voltage on the base of Q312 and turns it on. When Q312 turns on, it applies positive voltage through a 2K resistor to the Clock Multi-Vibrator and slows down the clock for this Intro set.

Q318 INTRO END SWITCHER

At the end of the Intro sequence Pin 14 of the Resetable Counter IC102 goes low, momentarily lowering the voltage on the base of the Intro End Switcher Q318. This turns on Q318 which applies positive voltage to the base of Intro Latch Transistor Q319. This turns off Q319 which removes positive voltage from the base of Latch Transistor Q320 which also turns off. This removes positive voltage from the base of the Intro Switcher Q321 and it turns off, removing the load from Intro Enable Q322 which also turns off. When Q322 turns off, the 10K load through D413 is no longer neutralized and a voltage drop results on the base of Q328 Rhythm Strobe Disable. This causes Q328 to turn on, supplying voltage to the Rhythm Strobe Transistor Q329 and the rhythm voice resumes playing.

Q315 INTRO HOLD RESET

The Intro Hold Reset only functions when the Intro Switch is being held on or is pressed directly after the Intro set. Positive voltage is applied to the collector of Q315 from the Intro Switch, but Q315 is held on during the Intro set by positive voltage from Pin 14 of IC102 causing its collector to be at a low level. At the end of the Intro set, Pin 14 makes a negative transition turning off Q315 which applies a positive voltage to reset Inverter Q299. This resets the Counter IC102 back to the first timing point for the next Intro set.

NOTE: This reset makes it possible to play two or more Intro sets in succession. If the Intro switch was held on and this reset failed to function, a dead measure would exist between Intro sets.

SCHEMATIC 16

INSTRUMENTATION

The Instrumentation circuits produce the instrument voices for the rhythm. The generator circuits are tied together at their output and applied to the rhythm preamp where the voices are amplified and sent via the rhythm volume control to the Main Volume Regulator.

IC107, IC108, IC109 RHYTHM GENERATORS

The Rhythm Generators are tuned resonant circuits. Pulses from the Rhythm Function Generator cause the circuits to generate short bursts of audio oscillation with diminishing amplitudes. The outputs of the Rhythm Generators are combined and applied to the Rhythm Preamp IC107D.

IC110 NOISE GENERATOR

The Noise Generator produces a random noise signal which is applied to the cathode of Diodes D484, D485 and D486. When the Snare, Brush or Cymbal Keyer circuits operate, this signal is passed through D484, D485 or D486 to the Cymbal, Brush or Snare Voicing circuits.

CIRCUIT DESCRIPTION

Q339, Q340, Q341 SNARE KEYER, SNARE VOICING

Pulses from Pin 6 of IC103 or the manual rhythm are applied to the High Drum Generator and through Inverter IC106D to the Low Drum Generator and Snare Keyer circuits. The pulses cause the High and Low Drum Generators to oscillate producing the High and Low Drum voices. These audio signals are then combined and routed to the rhythm preamp. Pin 2 of IC106D also applies a positive pulse to the base of Q339, Snare Keyer, turning it on. This causes positive voltage to turn on Diode D484 which allows noise signal to pass to the Snare Voicing circuit Q340 and Q341 where it is voiced for proper tonality. The voiced noise signal at the output of Q341 combines with the High and Low Drum signals, together creating the Snare Drum voice.

Q342, Q343, Q344 BRUSH KEYER, BRUSH VOICING

Pulses from Pin 21 of the ROM IC103 are inverted by IC106E and applied as positive pulses to the base of Q342, Brush Keyer, turning it on. This applies positive voltage to Diode D485 which now conducts allowing noise signal to pass to the Brush Voicing circuit. Here the signal is voiced for proper Brush tonality then applied to the Rhythm Preamp IC107D. With each positive pulse applied to Q342, a .27 uf capacitor is charged. The length of the Brush tone is regulated by varying the discharge time of this capacitor through Brush Length Regulator Q305 (see Schematic 15).

Q345, Q346, Q347 CYMBAL KEYER, CYMBAL VOICING

Pulses from Pin 7 of ROM IC103 are inverted by IC106F and applied as positive pulses to the base of Q345, Cymbal Keyer, turning it on. This applies positive voltage to Diode D486 which now conducts allowing noise signal to pass to the Cymbal Voicing circuit. Here the signal is voiced for proper Cymbal tonality then applied to the Rhythm Preamp IC107D. With each positive pulse applied to Q345, a .27 uf capacitor is charged. The length of the Cymbal tone is regulated by varying the discharge time of this capacitor through Cymbal Length Regulator Q308 (see Schematic 15).

IC107D RHYTHM PREAMP

Audio signals created by the Instrumentation circuits are applied to the Rhythm Preamp IC107D where the signal is amplified before being applied to the Rhythm Volume Control. The signal is then applied to the Main Volume Regulator.

MANUAL RHYTHM

Using the Manual Rhythm permits several of the Rhythm Instrumentation voices to be controlled independently of the ROM IC103. At keydown, voltage from the Lower Keyboard Keyswitches is developed into a trigger pulse by the Lower Keyboard Manual Rhythm Trigger Q337 and applied to the Snare Drum Switcher Q336 and the Noise Keyer Q348 via the Manual Rhythm pushbuttons. Pulses from the Pedal Cancel Trigger are used for the Bass Drum and Cymbal. Pedal keying voltage is applied to the Pedal Brush Shimmer Generator Q338 and through the Brush pushbutton to Noise Keyer Q348. The Snare and Bass Drum Switchers trigger instrumentation generators which develop the proper drum tone and applies this audio to the Rhythm Preamp IC107D. The Noise Keyer Q348 is common to the Cymbal and Brush switches. When Q348 is keyed, noise is applied to a voicing circuit where it is voiced and then routed to the Rhythm Preamp.

Q337 LOWER KEYBOARD MANUAL RHYTHM TRIGGER

The input to Q337 is connected to the Lower Keyboard Keyswitch Buss (C1-C4). With no keys depressed, a 24-volt potential is felt at the input of the .05 uf capacitor. At keydown, this voltage is lowered, developing a negative pulse across the .05 uf capacitor. This turns off Q337 and applies a positive pulse to the Cymbal Length Switcher Q335 and through switches to the Snare Drum Switcher Q336 and Noise Keyer Q348.

Q336 SNARE DRUM SWITCHER

A positive pulse from Q337 to the base of Q336 momentarily turns on Q336 which applies a low to the circuitry associated with the Snare Drum. The voicing for the Snare Drum is developed as described above for Q339, Q340, Q341 Snare Keyer and Voicing. Note that the Snare Cancel Switch will affect the Manual Rhythm Snare Drum.

Q348, Q349, Q350 NOISE KEYER AND VOICING

A positive pulse from Q337 is routed 1) through D462, D463 and the Cymbal switch and 2) through D462, D464 and the Brush switch to the base of Q348. This voltage turns on Q348 which applies a positive voltage to Q349 and forward biases Diode D487 which applies random noise to the Noise Voicing transistors Q349 and Q350 where the signal is voiced and amplified for proper tonality. The signal then passes to Rhythm Preamp IC107D.

NOTE: The Cymbal and Brush will have an identical tone and length when triggered from the lower manual.

Q332 BASS DRUM SWITCHER

Each time a bass pedal is pressed, a pulse is developed across a .22 capacitor (see Schematic 10). This momentarily lowers the voltage on the base of Pedal Cancel Trigger Q161 turning it off. A positive pulse is applied to the base of Q332. This turns on Q332 momentarily lowering the voltage at its collector which applies a low to the Inverter IC106A. IC106A outputs a positive pulse to the Base Drum Generator which develops the Bass Drum tonality.

Q333, Q334, Q335 PEDAL CYMBAL LENGTH REGULATOR & SWITCHERS

When a pedal is pressed, 1) A positive pulse is applied to the base of Q333 turning on Q333 and applying a positive pulse to the Noise Keyer Q348; 2) The pedal pulse is also routed through D461 and D463 to Q348 to give the Cymbal a slight accent at pedal keydown and 3) A DC voltage is applied from the Pedal Keydown Detector Q163 (see Schematic 10) to the base of Q335 turning on Q335 which holds Q334 off. When the pedal is released, the base of Q334 is ungrounded and positive pulses from lower keyboard Manual Rhythm Trigger Q337 will now reach the base of Q334. A pulse from Q337 will turn on Q334, momentarily grounding the base of Q333 which prevents the Pedal Cymbal from sustaining.

Q338 PEDAL BRUSH SHIMMER GENERATOR

Pressing a pedal applies DC voltage to the collector and base of Q338 turning it on. Audio signal from the D#3 (155 Hz) and E3 (164 Hz) is hetrodyned by Q338 and applied to a filter circuit. The filter removes all but the 9 Hz frequency. This is routed through D465 and the Brush switch to the Noise Keyer, modulating the noise.

SCHEMATIC 17

ORCHESTRAL SYMPHONIZER LATCH

IC113, IC114 8-BIT PRIORITY ENCODER

The primary function of the priority encoders is to provide a binary address for the active input with the highest priority. The order of priority is from top to bottom as shown on Schematic 17. The least significant bit appears at Pin 9 and the most significant bit at Pin 14. Pin 14 is normally low and goes high when a preset switch associated with IC113 is on. Pin 15 is normally high and goes low when an input is active. Pin 15 of IC113 is connected to Pin 5 of IC114. When there is an active input to IC113, Pin 15 goes low disabling IC114. Pin 15 of IC114 will also go low at this time. The priority encoders only have an output when a preset switch is on. Since the switches are momentary, the binary output from the encoders is only present while the preset button is being held. The binary output is then applied to the latch circuit.

IC115-IC119 ORCHESTRAL SYMPHONIZER LATCH

The latch circuit consists of IC115-IC119. Its function is to enable the Decoder IC120 and latch the binary address from the encoders into Decoder IC120. The latch circuitry will cancel a previously on preset by pressing a new preset or cancel a preset by repressing the same preset button.

ACTIVATING A NEW PRESET

Pressing a new preset switch applies a binary address corresponding to the preset switch being held, from the encoders to the D inputs of IC115 and IC116. If at least one of the D inputs is at a different level from the Q outputs, then one or more of the exclusive OR gates IC117 A-D will go high. This high level is inverted through IC118D and disables Latch Cancel Counter IC119B. (When a preset switch is pressed, Pin 15 of IC114 goes low, applying the low to the Reset inputs of IC119A&B. IC119A&B will count when the Reset input is low and the Enable input is high.) Initially, the Q outputs of IC119A&B are low. The Q outputs are applied as inputs to Counter Enable IC118C. Since both inputs to IC118C are low, the output of IC118C is high which enables IC119A. After eight positive transitions of the clock (220 Hz from A Divider) are applied to Pin 9 of IC119A, the Q output Pin 14 goes high. The Q output from IC119A is applied to the clock inputs of the Latch Flip-Flops IC115 & IC116, transferring the binary address at the D inputs to the Q outputs and to the inputs of the Decoder IC120. This binary address causes one of the Decoder outputs (Pins 1-11, 13-17) to go low activating a new preset voice. The Q output from IC119A is applied to IC118C and IC118D. Any high applied to a NOR gate applies its output low. This low disables IC119A&B and locks it in its present state until the active preset button is released which resets the Q outputs of IC119A&B low.

CANCELLING A PRESET

If the preset switch that was activated is pressed again, the binary address at the D inputs of IC115 and IC116 will be identical to the binary address latched at the Q outputs. Both inputs to each exclusive OR gate will be at the same level causing the outputs to be low. This low is inverted by IC118D and enables IC119B. After four positive transitions of the clock (220 Hz from A Divider), the Q output of IC119B goes high. This high is inverted through IC118C and disables IC119A. The Q output from IC119B is also applied to Latch Cancel IC118B. Any high to a NOR gate applies its output low. This low is applied to the reset inputs of IC115 and IC116, resetting the Q outputs low. This cancels the preset.

IC120 DECODER

The binary address from the latch circuit is applied to the decoder where it generates one of sixteen outputs. The decoder outputs are normally high and go low when active. Pressing a preset switch applies a low to the output pin corresponding to the active input of the encoders. This enables the lamp driver and DC switcher circuits.

Q353-Q367 LAMP DRIVERS AND DC CONTROL SWITCHERS

The low output from the active decoder line is applied to the base of a lamp driver and DC control switcher turning on this PNP switcher. When the switcher turns on, it lights the preset lamp at its collector and also applies positive voltage to various control circuits which give the character to the voice chosen.

Q368-Q382 SWITCHER DRIVERS

The low output from the active decoder line is applied to the base of a switcher driver transistor, causing it to turn off, which applies positive voltage to the FET switchers associated with the selected voice. This allows the audio signal from the various voicing circuits to pass to the power amplifiers. Some switcher enablers also apply voltage to the base of an orchestral chorus switcher.

Q383, Q384, Q385 ORCHESTRAL CHORUS SWITCHERS

Some of the Orchestral Symphonizer voices have a chorus effect. With one of these voices on, a positive voltage is routed to the base of the Orchestral Chorus 1, 2 or 3 Switcher. This turns on the chorus switcher enabling the chorus circuitry and regulating the amount of chorus for the voice chosen.

SCHEMATIC 18

Q389, Q391 ORCHESTRAL SYMPHONIZER KEYDOWN DETECTOR DRIVER & ENABLE

Turning an Orchestral Symphonizer preset on applies a low through D541 to the base of Q389. Q389 turns off which allows Q391 to turn on, supplying the keying voltage to the Orchestral Symphonizer keyswitch and keydown detector. If a brass preset is on, the output from the vibrato oscillator is allowed to pass to the base of Q389. This fluctuates the keying voltage and gives a tremolo effect to the brass voices.

Q390 PIANO, GUITAR KEYING VOLTAGE SWITCHER & GUITAR TREMOLO CANCELLER

Turning on a Piano or Guitar preset applies positive voltage to the base of Q390, turning it on. When Q390 turns on it ensures that Q389 is fully off, giving a maximum collector voltage which in turn gives a maximum keying voltage at the emitter of Q391 for the percussion type voices. Q390 also cancels the tremolo effect for the Guitar presets but vibrato can still be used with these presets. With a Piano preset on the vibrato oscillator is disabled, cancelling the tremolo effect for the presets and also the vibrato effect on all voices.

Q392 LOW VOLTAGE KEYING SWITCHER

Turning on the Clavecin, Oboe, Saxophone or Krumet voices turns on Q392 by applying a positive voltage to its base via the low voltage keying line. This lowers the base voltage on Q391 which in turn lowers the Orchestral Symphonizer keying voltage for the above-mentioned voices.

NOTE: The normal keying voltage of approximately 40V is reduced to approximately 10V when Q392 is turned on.

Q393 ORCHESTRAL SYMPHONIZER KEYDOWN DETECTOR

With an Orchestral Symphonizer preset on, positive voltage is applied to the base and emitter of Q393. Pressing a keyswitch at this time causes Q393 to conduct, applying positive voltage to two circuits: 1) This voltage is applied as a pulse to the Master Oscillator when Detuning Pulse Switcher Q394 is off; and 2) To the cathode of D544 enabling the Trumpet Mute Driver circuit.

Q394 DETUNING PULSE SWITCHER

Turning on any one of the following voices, Classic Guitar, Electric Guitar, Clavecin or Honky-Tonk lowers the voltage on the base of Q394 via the detuning pulse enable line. This causes Q394 to turn off allowing a pulse from the keydown detector to pass to the Master Oscillator Q8. This pulse momentarily detunes the Master Oscillator at keydown for the above-mentioned voices.

Q395-Q397 TRUMPET MUTE DRIVER & SHAPERS

Q396 is biased on slightly. The path for its collector voltage before keydown is through Diode D544. At keydown D544 becomes reverse biased by the collector voltage now present from Q393. At this time, the .1 capacitor at the collector of Q396 begins to charge. As the capacitor charges, the emitter voltage of Q397 begins to rise and Q395 begins to turn on. This lowers the base voltage on Q396 which turns on harder, causing a rise in Q397's emitter voltage which is again applied back to the base of Q395. Q395 turns on harder and the emitter voltage of Q397 continues to rise. This causes an exponential voltage rise at the emitter of Q397. The voltage continues to rise in this manner until Q395 saturates causing the emitter of Q397 to reach its maximum DC level. This waveform is applied to the Trumpet Mute filter and gates the audio signal through the filter at the amplitude of the waveform.

Q404, Q405 ORCHESTRAL SYMPHONIZER KEYER & PULSE KEYER

There are 61 upper keyboard orchestral keying circuits; one of which is shown on Drawing 18. Pressing a keyswitch with an Orchestral Symphonizer preset on applies positive voltage to the base of a Q404 through either the Brass or Piano/Guitar keying line. Only one of these keying lines can be enabled at any one time. The amplitude of keying voltage through the Brass keying line is such that Capacitor C2 charges relatively slow. This produces a steadily rising voltage at the emitter of Q404, causing the 330K resistor and capacitor C3 to charge to a changing reference. On initial keydown, this will cause the output of Q405 to vary from a wide pulse width of small amplitude to a narrow pulse width of higher amplitude and creates the breathy keydown effect for the Brass voices. After the emitter of Q404 reaches its maximum DC level, the output of Q405 will be a pulse waveform with approximately a 10% duty cycle at the frequency of the input signal. The output of Q405 then passes through Diode D559 where it is separated into groups and routed to various filtering circuits. With a Brass voice on, the sustain line is grounded and releasing the key causes any remaining capacitor charge to discharge through a D556 and a 120K resistor to ground. The keying voltage through the Piano/Guitar keying line is of a higher amplitude and is applied as a pulse to the base of Q404. This causes the emitter of Q404 to go to its maximum voltage at keydown creating a positive pulse at the collector of Q405. This pulse is routed through D558 to the strike tone amp and creates the percussive keydown effect for the Piano, Guitar and Banjo/Mandolin presets. Also, the emitter voltage from Q404 biases on Diode D560 allowing audio signal to pass to the sawtooth filtering groups. If the key is held down, the decay time of this pulse is determined by voltage on the snub line through Diode D557. After the snubbing, the remaining capacitor voltage holds on Q404 for the duration of its discharge time. If the key is released before the decay is complete, the capacitor discharges through Diode D556, a 120K resistor and Q402 to ground. (This discharge path is blocked as long as a key is being held because of the reverse bias condition of D556.) If a Piano preset is on, the glide switch becomes a sustain switch. Hitting the glide switch after the key is released, applies positive voltage to the base of Q402. This causes Q402 to turn off which removes ground from the 61 note sustain line. This causes C2 to discharge onto the base of Q404, holding it on and creating a sustain effect.

Q406, Q407 ORCHESTRAL SYMPHONIZER PEDAL KEYER & PULSE KEYER

With an Orchestral Symphonizer preset on, positive voltage is applied to the emitter and base of Q171 (see Schematic 10). If the Orch to Pedal tab is on and a pedal is pressed, a positive voltage is applied to the base of Q172, turning it on which in turn causes Q171 to turn on. This applies a positive voltage through either the pedal brass keying line or the pedal Piano/Guitar keying line to the base of Q406 Orchestral Symphonizer pedal keyer.

The Orchestral Symphonizer Pedal Keyer circuit is identical in operation to the 61 upper keyboard Orchestral Symphonizer circuits. See Q404 and Q405 for circuit description.

Q398 PIANO SNUB & BRASS DISABLE SWITCHER

Turning on an Orchestral Symphonizer Piano preset applies positive voltage to the base of Q398. This turns Q398 on and performs two functions: 1) it provides a ground for the voltage divider (12K, D545 and the 1.5K) which develops the voltage for the snub line and 2) the Brass keying line is grounded through Diode D546 disabling this keying line when a Piano preset is on.

Q399 GUITAR SNUB & BRASS DISABLE SWITCHER

Turning on an Orchestral Symphonizer Guitar preset applies a positive voltage to the base of Q399. This turns Q399 on and performs two functions: 1) it provides a ground for the voltage divider (12K, D547 and the 1.8K) which develops the voltage for the snub line and 2) the Brass keying line is grounded through Diode D548 disabling this keying line when a Guitar preset is on.

Q400 PIANO & GUITAR DISABLE SWITCHER

Turning on an Orchestral Symphonizer Brass preset applies positive voltage to the base of Q400 turning it on. When Q400 turns on it grounds the Piano/Guitar keying line disabling this keying line when a Brass preset is on.

Q403 SUSTAIN CANCEL SWITCHER

Turning on a Brass or Guitar Orchestral Symphonizer preset applies positive voltage to the base of Q403 turning it on. When Q403 turns on it grounds the Orchestral Symphonizer sustain line, cancelling sustain for the Brass and Guitar presets.

Q401 GLIDE CANCEL SWITCHER

Turning on an Orchestral Symphonizer Piano preset applies positive voltage to the base of Q401 turning it on. When Q401 turns on it grounds the input to the glide circuit cancelling glide. Pressing the glide switch at this time applies positive voltage to the sustain line. This blocks the discharge path through D556 and Q402 and gives a sustain effect to the Piano presets.

SCHEMATIC 19

ORCHESTRAL SYMPHONIZER QUALITY CONTROL

Audio signal from the pulse keyer and sawtooth keying circuits is separated into groups and routed through various filtering circuits where the tonal quality of each voice is created. The strike tone pulse is routed through IC130A where the length of this pulse is determined by regulating the DC level at Pin 3. The pulse is then filtered and used with the percussive voices of the Orchestral Symphonizer. Turning on a preset applies positive voltage from a Switcher Driver Transistor to one of the FET switchers turning it on, which allows the audio signal to pass to one of the volume regulators.

IC133, IC134, Q421, Q422 TRUMPET MUTE FILTER

This circuit is a State Variable Filter that acts in conjunction with the 800p capacitors to form an RC Low Pass filter. Signal from the Trumpet Filter is gated through the filter at the amplitude of the drive waveform applied to Pins 5 of IC133 and IC134. The output is a low impedance signal that is routed to the Chorus Channel Volume Regulator IC136 when the Trumpet Mute preset is on.

IC131B, IC135, Q429 ORCHESTRAL SYMPHONIZER MAIN CHANNEL MIXING PREAMP, VOLUME REGULATOR & EMITTER FOLLOWER

Audio signal components of the active Orchestral Symphonizer preset are mixed and amplified by IC131B. The output of IC131B is routed to the input of the Orchestral Symphonizer Chorus circuit and also to Regulator IC135. The amplitude of the voltage applied to Pin 5 of IC135 from the Orchestral Volume Control VR51 regulates the amplitude of IC135's output signal. This signal is then passed through Q429 where it is transformed into a low impedance signal before being routed to the Main Mixing Preamp. The signal that is routed to the chorus circuit is phase modulated and applied to the input of the Chorus Channel Volume Regulator IC136.

IC136, Q430 ORCHESTRAL SYMPHONIZER CHORUS CHANNEL REGULATOR & EMITTER FOLLOWER

Audio signal from the Orchestral Symphonizer Brass voices is applied to IC136 where the amplitude of the output signal is determined by Orchestral Symphonizer Volume Control VR51. Phase modulated audio signal from the Orchestral Symphonizer Chorus circuit is also routed through IC136. These signals are then applied to Q430 where they are transformed into a low impedance signal before being routed to the Reverb Circuit and Phase 2 and 3 Volume Regulators.

SCHEMATIC 20

ORCHESTRAL SYMPHONIZER CHORUS

Q434, Q435 & Q436 CHORUS ENABLE AND DEPTH REGULATORS

Turning on an Orchestral Symphonizer preset that has a chorus effect applies positive voltage through Diodes D604, D605 or D606 to the emitter of Q434. This turns Q434 on and effectively grounds Pin 9 of IC139 enabling the Chorus Speed Oscillator. Q435 and Q436 regulate the amplitude of the oscillator output by regulating the amount of shunt resistance at the output of the oscillator. Q435 and Q436 are normally saturated. This is the condition when a preset using Chorus 1 (Grand Piano, Harpsichord, Clavecin, Electric Guitar) is on. With Q436 saturated, Q435 has no effect on the circuit and the oscillator output sees a 1K resistor to ground through Q436. (The +11.4V supply appears as a ground to the oscillator output.) This condition gives the least chorus effect. Turning on the Classic Guitar preset which uses Chorus 2, applies positive voltage through Diode D601 and shuts off Q436. The oscillator output now sees an 11K shunt resistance through Q435. This gives a slightly greater chorus effect for Classic Guitar. With the Honky-Tonk, Carillon or French Horn presets on, positive voltage is routed through Diodes D601 and D603, turning off both Q435 and Q436. This removes the shunt from the oscillator output, allowing it to be at its maximum amplitude. This gives a maximum chorus effect to the presets using Chorus 3. At this time the 20 uf capacitor is referenced through the series combination of a 1K, 10K and 470K resistors to +11.4 volts.

IC139C&D AND Q437 & Q438 CHORUS SPEED AND VOLTAGE-CONTROLLED OSCILLATORS

When the Chorus Speed Oscillator is enabled, it produces a .7 Hz triangular waveform at the output of IC139D. The amplitude of this waveform is Regulated at the output of IC139D before being routed to the voltage controlled oscillator. The voltage controlled oscillator runs at a speed which is inversely proportional to the amplitude of the input from the speed oscillator. Since the amplitude of the input from the speed oscillator is constantly changing, the frequency of the voltage controlled oscillator varies. This in turn varies the delay time of the audio signal through the bucket brigade resulting in a phase modulated signal.

IC139A INPUT LOW-PASS FILTER

The input Low-Pass Filter prevents intermodulation by filtering out certain high frequency signals. The output of this filter is then applied to the input of the bucket brigade.

IC140 BUCKET BRIGADE

The Bucket Brigade is an analog shift register which samples the input audio signal at the rate of the Clock pulses from the Voltage Controlled Oscillator. Each time a negative clock pulse is applied to Pin 2 and then Pin 12 of IC140, the audio signal is transferred to the next stage of the Bucket Brigade until it appears as output at Pin 14. This causes a delay between the input and output signal. Since the frequency of the clock pulses are constantly varying, the delay time of the signal through the Bucket Brigade also varies, phase modulating the audio. The audio signal output from the Bucket Brigade is then applied to the low pass filter.

IC139B OUTPUT LOW-PASS FILTER

The output Low-Pass Filter filters out the high frequency clock component that is contained in the audio signal at the output of the Bucket Brigade. This phase modulated signal is then routed through the Chorus Channel Volume Regulator and Emitter Follower to the Phase 2 and 3 Power Amplifiers.

SCHEMATIC 21

CARILLON KEYING & FILTERING

The Upper Keyboard C4 through C6 (Lower C3-C5) keyswitches are used to key the Carillon preset. Each Carillon note is a combination of four pitches. The signals are collected and filtered before being routed to the Carillon Mixing Preamp.

The C6 Keyer is used for the following example. When the Carillon preset is on, the Piano/Guitar Keying Line is active. Pressing the C6 Keyswitch applies a positive pulse from the emitter of the Orchestral Symphonizer Keyer (see Schematic 18) to the base of Carillon Keyer Q447. Q447 turns on momentarily applying a positive pulse to four signal diodes D619. The four audio signals are the 2-, 2-2/3-, 4- and 6-2/3-foot pitches (C8, G7, C7 and E6 octave frequencies). The signals are applied to the Carillon filters. The outputs of the filters are routed to the Carillon Mixing Preamp (Summing Amplifier, unity gain) shown on Schematic 19.

The positive pulse applied to the base of Q447 charges a .33 uf capacitor. After the keying pulse occurs, the capacitor discharges to the voltage level on the 25-note snub line. The remaining voltage discharges onto the base of Q447 giving sustain to the Carillon preset.

SCHEMATIC 22

GOLDEN HARP

IC148B & IC150B HARP SPEED OSCILLATOR

The Harp Speed Oscillator produces a symmetrical square wave output at Pin 11 of IC150B. The frequency of this output is adjustable from 3 to 20 Hz by the Harp Speed Control VR60. If the Rhythm Sync Switch is on and a rhythm is on, Pin 1 of IC148B is held high, disabling the Harp Speed Oscillator. At this time the rhythm clock output is routed through Diode D721 to the scan oscillator and the speed of the Harp is controlled by the rhythm. If the Rhythm Sync Switch happens to be on and no rhythm is on, the input from the rhythm clock at the anode of D721 is reset to a low level and Pin 1 of IC148B is grounded through the Rhythm On Switcher Q283. This enables the Harp Speed Oscillator which now has an output through Diode D720 and D722 to the Scan Oscillator.

Q469 HARP FOOTSWITCH ENABLE

The Golden Harp and the Magic Chord Minor Enable are activated from the same footswitch. When the Magic Chord tab is off, a positive voltage from Q280 turns on Q469 applying positive voltage via Diodes D714 and D724 to Pin 8 of IC148C disabling the Scan Oscillator. When the Minor/Golden Harp Footswitch is activated, the emitter voltage is grounded through D713. If a lower keyswitch is pressed, Q244 turns on which provides a low enable for the Scan Oscillator. With the Magic Chord tab on, Q469 is turned off removing this DC voltage from the Harp Enable line. Positive voltage is applied through the Golden Harp tab and D715 to the Harp Enable line, disabling the Scan Oscillator. If the Golden Harp tab is placed to the on position, the positive voltage is removed from the Harp Enable line. Pressing a Magic Chord keyswitch will apply AOC Data from the Magic Genie AOC Decoder to the AOC Drivers. Q244 will be turned on applying a low to the Scan Oscillator. The Golden Harp circuit will continue to play as long as AOC Data is being applied to the AOC Drivers.

IC148C & IC148D SCAN OSCILLATOR

To enable the Scan Oscillator, the following conditions must be met: 1) the Q output of IC152A must be low, 2) a low is applied to D722 from the Inverter or the Rhythm Clock, 3) the Minor/Golden Harp Footswitch is activated and 4) a lower keyswitch is pressed. When the inputs to IC148C Pin 8 are low, the Scan Oscillator is enabled. The Oscillator runs at a frequency of approximately 700 Hz producing outputs that are inverted from each other at Pins 10 and 11 of IC148. The output from Pin 10 is applied to Up/Down Counter IC153 and the output from Pin 11 is applied to the Stop Scan Triggers IC151B and the Pulse Swallower Reset IC150C.

IC153, IC154 UP/DOWN COUNTER & DECODER

With a lower keyswitch pressed and the Golden Harp footswitch on, Up/Down Counter IC153 is enabled. The Up/Down Counter advances each time a positive pulse is applied to Pin 15 and generates one of sixteen binary outputs at Pins 6, 11 14 and 2. The least significant bit appears at Pin 6 and the most significant bit at Pin 2. If Pin 10 is held high, it generates a binary up count; if Pin 10 is held low, it generates a binary down count. Applying a positive pulse to Pin 1 resets the counter to its zero count. The output of the counter is applied to the Up/Down Decoder IC154 where it generates one of sixteen outputs. The decoder outputs are normally high and go low when active. They are sequentially enabled. Pin 1 being the lowest count and Pin 17 the highest. Pins 1 or 17 trigger the octave counter, depending on the position of the Down only switch. Pins 2-14 (excluding 12) sequentially enable the 12 Enable Transistors Q473. The outputs on Pin 15 and 16 are not used.

IC151A&B, IC152A STOP SCAN TRIGGERS & STOP SCAN

The Harp Speed Oscillator and Stop Scan circuit work together to control the scan oscillator which in turn is used to generate the stepping pulses for the Up/Down Counter IC153. When the output from the Harp Speed Oscillator, the Q output Pin 1 of IC152A and the Harp Enable and Reset Line are low, the scan oscillator runs producing the stepping pulses for the Up/Down Counter IC153. Applying a pulse to Pin 15 of IC153 causes one of the decoder lines of IC154 to go low. If the lower manual key for that stage is not being held, nothing happens and the scan oscillator continues to oscillate, generating another step on its next cycle which advances IC154 to the next note. If the next note is present from the lower manual, positive voltage is routed through Diode D726 to Pin 8 of IC150C and also to Keyers Q474. On the next half cycle of the Scan Oscillator, Pin 11 of IC148D applies a high to Pin 13 of IC151B. The Q bar output of IC152B is also high, (this Q bar output only changes state when the Counter IC153 is transferring from an up count to a down count or from a down count to an up count) and is applied to Pin 12 of IC151B causing Pin 11 of IC151B to go high. The output from Pin 11 is applied to Pin 9 of IC151A. Pin 8 of IC151A is high due to the active lower manual note. This causes the output of IC151A to go high, clocking Pin 3 of IC152A. The Q output Pin 1 of IC152A now goes high and is applied through Diode D723 to Pin 8 of IC148C. This locks the output of IC148C low and disables the scan oscillator. The stop scan operation has taken place while the output of the Inverter Q470 is still at a low level. On the next half cycle of the Harp Speed Oscillator, Q470 makes a positive transition and resets the Q output of IC152A to a low level. The scan oscillator is still inhibited through Diode D722 due to the high level of Q470. On the next half cycle of the Harp Speed Oscillator, Q470 goes low and the scan oscillator runs again at a rate of 700 Hz and searches for the next active note in the sequence.

Q474 GOLDEN HARP KEYERS

This circuit contains 36 Emitter Follower Keyers Q474. The keyers are arranged in 12 identical circuits, each consisting of 3 keyer transistors. Each of the 12 circuits corresponds to a note in an octave. Each of the 3 keyers in a circuit is associated with a different octave starting at the first octave and running through the third octave. Up/Down Decoder IC154 provides enable outputs (low levels) sequentially for each note of an octave. For example, if IC154 Pin 2 is low, C# Enable Q473 is turned off. If at this time the C#1, C#2 or C#3 Lower Manual Keyswitch is pressed, a positive voltage is applied to the 2.2K collector resistor of the C# Enable Q473. The positive voltage is 1) applied through Diode D726 (C# circuit) triggering the stop scan circuitry and 2) routed to the base of the C#1, C#2 or C#3 Keyer Q474, depending on which octave lead is ungrounded at that time. Only one octave lead is ungrounded at any one time. The voltage then turns on Q474 (C# circuit) and keys a note through the Upper Diode Keying circuits.

IC149 & Q472 UP/DOWN COUNT ENABLE GATES & DRIVER

In normal operation (virtuoso off) the output of IC148A Pin 4 is always low. This will cause Pin 11 of IC149C and Pin 8 of IC149D to lock in a high state. Also the low output of IC148A is inverted through IC149A locking Pin 6 of IC149B in a high state. In the up count mode of operation, the base of Q472 is low causing its collector to be high. This high level is applied to Pin 5 of IC149B. Since Pin 6 of IC149B is locked high its output at Pin 4 will be low. Since Pin 8 of IC149D is locked high, its output at Pin 10 will go high. This high output is applied to Pin 10 of IC153 Up/Down Counter, causing it to generate a binary up count. In the down count mode of operation, positive voltage will be routed to the base of Q472, turning it on which puts its collector at a low level. This low is applied to Pin 5 of IC149B. Since Pin 6 of IC149B is locked high, its output at Pin 4 and correspondingly the input Pin 9 of IC149D will go high. Since Pin 8 of IC149D is locked high the output of IC149D will go low. This low level is applied to Pin 10 of Up/Down Counter IC153, causing it to generate a binary down count.

IC150A&C, IC152B PULSE SWALLOWER & RESET

When the count changes direction, the first active note that is found in the new direction will be the same as the last active note played in the old direction. The result would be that the highest or lowest note (depending on the count direction) being held would play twice at the transfer point. The purpose of the pulse swallower circuit is to prevent this condition by not stopping the scan oscillator at the first active note after the transfer.

When there is a count direction change, the collector of Q472 makes a transition from high to low, or from low to high. If the transfer is from an up count to a down count, the collector makes a negative transition which is inverted by IC150A and applied as a positive pulse through Diode D716 to the set input Pin 9 of IC152B. If the transfer is from a down count to an up count, the collector makes a positive transition which is applied as a positive pulse through Diode D718 to the set input Pin 9 of IC152B. This pulse causes the Q bar output Pin 14 of IC152B to go low. When the first active note after the transition is reached, a positive voltage is routed through Diode D726 to Pin 8 of IC150C. On the next half cycle of the Scan Oscillator Pin 11 of IC148D goes high. This high level is applied to Pin 13 of IC151B, but this gate is now disabled due to the low level at Pin 14 of IC152B. This prevents an output on IC151B which in turn prevents the output of IC151A from going high and clocking Stop Scan Flip-Flop IC152A. Thus the scan oscillator continues to run, bypassing this note in the sequence. On the next half cycle of the scan oscillator Pin 11 of IC148D goes low. This causes the output of the Pulse Swallower Reset IC150C to go high and clock Pin 13 of IC152B. This resets the Q bar output high and enables the stop scan triggers for the next active note in the sequence.

NOTE: Pin 13 of IC152B is clocked each time Pin 11 of IC148D goes low, but because of the condition of the J&K inputs, the same output condition is reinstated. That is, the Q bar output remains high.

IC150D, IC155 & IC156 OCTAVE COUNT TRIGGER, COUNTER & DECODER

The octave counter IC155 advances each time a positive pulse is applied to Pin 15 and is capable of generating one of sixteen binary outputs at Pins 6, 11, 14 and 2. The least significant bit appears at Pin 6 and the most significant bit at Pin 2. The maximum binary count IC155 reaches is 6 in the Up/Down 3 mode of operation. If Pin 10 is held high, IC155 generates a binary up count. If Pin 10 is held low, it generates a binary down count. In normal operation, Virtuoso off, Pin 10 is always high. Applying a positive pulse to Pin 1 resets the counter to its zero count. The output of IC155 is applied to the octave count Decoder IC156 where it generates one of ten outputs.

The octave decoder outputs are normally low and go high when active. They are sequentially enabled; Pin 3 being the lowest count and Pin 7 the highest. The count sequence is from top to bottom as shown on Drawing 22. Pins 3, 14, 2, 15, 1 and 6 sequentially enable the octave switcher transistors; Pin 7 is used as the reset pulse in the Up/Down 3 mode of operation. Three of the ten decoded outputs from Pins 4, 9 and 5 are not used.

When the Up/Down Decoder IC154 reaches its maximum count, Pin 17 (minimum count, Pin 1 in the down only mode of operation) goes low and is inverted through Octave Count Trigger IC150D, applying a positive pulse to Pin 15 of Octave Counter IC155. This advances Counter IC155 which sequential enables the octave switchers through Decoder IC156.

UP ONLY

With the down only switch in the off position, the Golden Harp is in the up only mode of operation. Positive voltage is routed through the series switch configuration to Pin 1 of IC157B and through Diode D732 to Pin 1 of IC151C. These gates can now be enabled as the octave count advances. Q472 is cut off applying a high level to Pin 10 of IC153. When the Scan Oscillator is enabled, the Counter IC153 begins an up count. At this time, the Octave Counter is at its zero count and Pin 3 of IC156 is high. This high level is inhibited by gate IC157A and there is no output to the switchers. In this condition, the bases of Q475 and Q478 are low causing Q476 and Q479 to be saturated. With Q476 and Q479 saturated, the high octave and middle octave enable lines are grounded and Q477 will be off, enabling the low octave. On the next advance of the Octave Counter, Pin 14 of IC156 goes high and turns off Q479 through Q478. When Q479 turns off, it unclamps the middle octave enable line allowing the middle octave to play. At the same time positive voltage is applied to Q477, turning it on which clamps the low octave enable line to ground. On the next advance of the Octave Counter, Pin 2 of IC156 goes high. This high level is applied to Pin 2 of IC157B. Since Pin 1 is high due to the down only switch position, the output of IC157B Pin 3 goes high and turns off Q476 through Q475. When Q476 turns off, it unclamps the high octave enable line allowing the high octave to play. At the same time, positive voltage is applied to Q477, turning it on and clamping the low octave enable line to ground. When the octave counter again advances, Pin 15 of IC156 goes high. This high level is applied to Pin 2 of IC151C. Since Pin 1 of IC151C is high due to the down only switch position, the output of IC151C goes high applying a positive voltage through Diode D730. This resets Octave Counter IC155 and Up/Down Counter IC153 back to their zero count. This sequence will continue in this manner as long as the Scan Oscillator is enabled.

DOWN ONLY

With the down only switch on, positive voltage is routed through the series switch configuration to Pin 5 of IC157A and through Diode D733 to Pin 1 of IC151C. These gates can now be enabled as the octave count advances. The positive voltage from the switch is also applied to the base of Q472 turning it on, applying a low level to Pin 10 of IC153. Also the octave advance pulse applied to IC150D now comes from Pin 1 of IC154. When the Scan Oscillator is enabled, the Counter IC153 begins a down count. At this time Octave Counter IC155 is at its zero count and Pin 3 of IC156 is high. This high level is applied to Pin 6 of IC157A. Since Pin 5 is high due to the down only switch position, IC157A has a positive output at Pin 4. This positive voltage turns off Q476 through Q475 ungrounding the high octave enable line, allowing the high octave to play. At the same time this voltage is also applied to Q477, turning it on which clamps the low octave enable line to ground.

On the next advance of the Octave Counter, Pin 14 goes high turning off Q479 through Q478 ungrounding the middle octave allowing it to play. At the same time this voltage is also applied to Q477 turning it on which clamps the low octave enable line to ground. The Octave Counter is advanced again and Pin 2 goes high, but this voltage cannot pass to the octave switches and the low octave is enabled by the saturated condition of Q476 and Q479. After the next count, Pin 15 of IC156 goes high. This high level is applied to Pin 2 of IC151C. Since Pin 1 is high due to the position of the down only switch, the output of IC151C goes high applying a positive voltage through Diode D730. This resets Octave Counter IC155 and Up/Down Counter IC153 back to their zero count. This sequence will continue in this manner as long as the Scan Oscillator is enabled.

UP/DOWN 2

With the Up/Down 2 switch on, positive voltage is routed to Pin 13 of IC157C and also from the arm of this switch to IC151D Pin 6. These gates can now be enabled as the octave count advances. Q472 is cut off applying a high level to Pin 10 of IC153. When the Scan Oscillator is enabled, the Counter IC153 begins an up count. The up count for the first two octaves operates as described in the up only mode. On the third advancement of the Octave Counter Pin 2 goes high. This high level is applied to Pin 12 of IC157C. Since Pin 13 is high due to the on position of the Up/Down 2 switch, Pin 11 of IC157C goes high. This performs two functions: 1) Positive voltage turns off Q479 through Q478 disabling the low octave and enabling the middle octave; 2) Positive voltage is applied to the base of Q472 turning it on which applies a low level to Pin 10 of IC153. This initiates a down count and the middle octave now counts down. On the next advancement of the Counter, Pin 15 of IC156 goes high and holds the base of Q472 high.

This holds the counter in the down count mode. At this time no voltage is routed to the switchers, automatically enabling the low octave which also counts down. On the next counter advance, Pin 1 of IC156 goes high resetting the Octave and Up/Down Counters IC155 and IC153 to their zero count through IC151D. This sequence continues in this manner as long as the Scan Oscillator is enabled.

UP/DOWN 3

With the Up/Down 3 switch on, positive voltage is routed to Pin 8 of IC157D. Q472 is cut off applying a high level to Pin 10 of IC153. When the Scan Oscillator is enabled the Counter IC153 begins an up count. The up count for the first two octaves operates as described in the up only mode. On the third advancement of the Octave Counter, Pin 2 of IC156 goes high and is routed through D734 to Pin 9 of IC157D. Pin 8 of IC157D is high due to the on condition of the Up/Down 3 switch. This causes the output Pin 10 of IC157D to go high. This high level turns off Q476 through Q475 and enables the high octave. Voltage is also applied to Q477 clamping the low octave enable line to ground. When the octave counter is advanced again, Pin 15 goes high. Positive voltage is routed through Diode D735 to Pin 9 of IC157D. This holds IC157D in the same state as the previous count and the high octave is still enabled. Positive voltage from Pin 15 is also routed to the base of Q472, turning it on. This applies a low to Pin 10 of IC153 which initiates a down count. This causes the high octave to play again but in the down direction. On the next count, Pin 1 of IC156 goes high which holds Q472 on, and also enables the middle octave through Q478 and Q479. This allows the middle octave to play in the down direction. When the octave counter advances again, Pin 6 of IC156 goes high holding Q472 on; the low octave is automatically enabled by Q477, since there is no output to the switchers. This enables the low octave to count down. The counter advances again and Pin 7 of IC156 goes high, resetting the octave and up/down counters to their zero count. The Up/Down 3 sequence will continue in this manner as long as the Scan Oscillator is enabled.

VIRTUOSO

In the Virtuoso mode of operation, the up/down counter will count three active notes in one direction, reverse direction for one active note, then resume in the original direction for three more active notes and so on. Turning on the Virtuoso switch turns off Virtuoso Switcher Q471. This removes the reset condition from Pulse Dividers IC147A&B, allowing them to count. IC147A&B comprise two divide-by-two dividers. The clock input of IC147A is connected to Stop Scan Trigger IC151A. The output of IC151A goes high and clocks IC147A each time an active note is found. After three active notes have been found, the Q bar outputs of IC147A&B will both be low. This causes the output of Gate IC148A to go high. This high level is applied to the up/down enable gates and will invert the existing condition at Pin 10 of IC149D. When the next pulse from the scan oscillator is applied to Pin 15 of IC153, the direction of the count is reversed and the note previous to the one that has just been played is played again. When the scan oscillator is stopped to play this note, another pulse is applied from IC151A to the Virtuoso Pulse Dividers. This inverts the output of IC148A which in turn inverts the output of IC149D. The output of IC149D is now in its original state and the counter will resume its original direction of count until three more active notes have been found. Also, when the output of IC149A goes high, it applies a low through Inverter IC149A to Pin 10 of Octave Counter IC155. If, when the count is reversed, an octave must be crossed to play the previous note, a pulse will be applied to Octave Counter IC155 Pin 15. The low on Pin 10 will allow the Octave Counter (which normally counts only in the up direction) to count down and enable the correct octave line for this note.

SCHEMATIC 23

REVERB, VOLUME REGULATORS & AMPLIFIERS

Audio signal from the Flute Mixing Preamp, Main Mixing Preamp, Bass Emitter Follower, Orchestral Symphonizer and Phase 1 Output Amps is channelled two ways simultaneously: through the reverb circuitry and their respective volume regulators. The reverb output is then routed to the Main Volume Regulators.

IC161A REVERB DRIVER

Audio output signal from the Flute Mixing Preamp, Main Mixing Preamp, Bass Emitter Follower, Orchestral Symphonizer and Phase 1 Output Amps is applied to IC161A where it is amplified and connected to the Reverb Spring unit producing the reverb effect.

IC161B REVERB RECOVERY AMP

Reverberating audio signal from the Reverb Spring unit is applied to IC161B. The signal is amplified by a gain factor of approximately 33 and transformed to a low impedance signal before being routed to the Main Volume Regulator via the Reverb Length Control VR62.

Q483 VOLUME REGULATOR DRIVER

The amplitude of the signal at the output of the volume regulators is controlled by the Volume Regulator Driver Q483. Pressing the expression shoe down moves the lamp in Expression Pedal Photocell P5 closer to the photocell, decreasing the photocell's resistance, which increases the voltage on the base of Q483. This in turn increases the emitter voltage of Q483. Applying this voltage to Pin 5 of the volume regulators increases the amplitude of their output signal.

IC162, Q484 MAIN VOLUME REGULATOR & OUTPUT AMP

Audio signal from the Main Mixing Preamp, Bass Emitter Follower, Rhythm Output Amp and Reverb is applied to IC162 where the amplitude of the Main output signal is regulated. Some signal from the Bass Emitter Follower bypasses IC162 allowing some Bass signal to pass to the Main Output Amp Q484 when the organ is at minimum volume. The output of IC162 is applied to Q484 where it is amplified before being routed to the Main power amplifier.

IC163, Q485 LESLIE VOLUME REGULATOR & OUTPUT AMP

Audio signal from the Flute Mixing Preamp and the Bass Emitter Follower is applied to IC163 where the amplitude of the Leslie output signal is regulated. The output of IC163 is applied to Q485. Here the signal is amplified before being routed to the Leslie power amplifier.

IC164, IC165 PHASE 2 AND 3 VOLUME REGULATORS

Audio signal from the Phase 2 and 3 Output Amps and the Orchestral Symphonizer is applied to IC164 and IC165 where the amplitude of these signals is regulated. The outputs from the Volume Regulators is then routed to the Phase 2 and 3 Power Amplifiers.

Q485-Q491 AND IC166 MAIN, LESLIE, PHASE 2 CHORUS AND PHASE 3 CHORUS AMPS

These four amplifiers are identical. They are self-biasing with a complimentary output configuration. The power output is rated at 35 watts RMS for each amplifier. The function of the preamp is to boost the signal voltage to a point where they can be used by the driver circuit. Preamp Q487 senses the signal at the output of the amplifier and controls it by regulating the signal input at Preamp Q486. The driver inverts the audio voltages so the outputs work in push-pull. The outputs convert the voltage from the driver into high current, low voltage output signal that is connected via the speaker enable relay contacts to the speakers.

With no signal input, Bias Switcher Q489 is on and there is virtually no current being drawn by the outputs. IC166A&B have a total gain of approximately 1000. When an input signal as small as one milli-volt is applied to the amp, the bias on the base of Q489 is overcome and it shuts off, enabling the amplifier.

Q492 SPEAKER ENABLE RELAY DRIVER

At organ turn on, the DC voltage applied to the base of Q492 sees a ground through the 15 uf capacitor. As the capacitor charges, the voltage at the base of Q492 increases which eventually turns on Q492 and activates the Speaker Enable Relay. The time delay is the RC time constant determined by the 150K resistor and the 15 uf capacitor. When a headphone is used, the base of Q492 is grounded through a 1K resistor which causes RL1 to de-energize.

SCHEMATIC 24

POWER SUPPLY

AC line voltage is converted into positive and negative DC supply voltages using step down Transformer T1 and Rectifier Bridge D751. Regulators IC170-IC176 are used as voltage regulators on several supply lines. IC170 has a 100 ohm DC offset resistor. The output of IC170 will measure 9.5 volts to ground reference. IC173 has a DC offset Voltage Adjust VR67. It is adjusted for 14 volts at the output of IC173. Some of the voltage divider circuits are located on various boards throughout the organ. They are enclosed in dotted boxes with a note for their location. Q495 regulates voltage for the DC control. A 5-amp slo-blo fuse is employed in the primary circuit of the power supply to prevent component damage which may be caused by a short circuit.

ADJUSTMENTS

SCHEMATIC 1

VR1 VIBRATO SPEED ADJUSTMENT

Proper speed of the Vibrato Oscillator is between 6 and 7 Hz. The Vibrato Oscillator will not oscillate if adjustment is extreme.

L1 TUNING COIL

This adjustment is carefully set at the factory. Should tuning be necessary, it is suggested a tuning fork for a certain note be used (C for example). By holding down a key (C for example), adjust the tuning coil with a non-metalic screwdriver until no roll or beat is heard between the organ note and fork tone. When this note is properly tuned, the TOS tuning is automatically locked in.

SCHEMATIC 2

VR4 SYMPHONIC WOW ADJUSTMENT

This adjustment should be set for 1.2 volts at the cathode of D56. Too extreme an adjustment will result in the loss of the Symphonic Wow effect.

SCHEMATIC 7

VR15 GENIE THUMP ADJUSTMENT

The Genie length is factory-set by component values. The purpose of the Genie Thump Adjustment is to eliminate any DC transient (thump) that may occur when playing the Genie Accompaniment voices. To adjust, turn on any rhythm and a Genie accompaniment tabswitch (Piano, Guitar, Banjo) set rhythm volume at minimum and expression shoe at maximum. Turn adjustment until minimum thump is heard. If thump level cannot be reduced satisfactorily by adjustment, then replace Genie Modulator IC.

SCHEMATIC 8

VR19 PERCUSSION THUMP ADJUSTMENT

The Percussion length is factory-set by component values. The purpose of the Percussion Thump Adjustment is to eliminate any DC transient (thump) that may occur when playing the Banjo, Harmonic Flute or Mandolin voices. To adjust, set expression shoe on maximum. Turn on either the Mandolin, Harmonic Flute or Banjo tabs. Turn adjustment until minimum thump is heard. If thump cannot be reduced satisfactorily by adjustment, then replace Modulator IC.

SCHEMATIC 10

VR22 PEDAL WOW REST ADJUSTMENT

This adjustment should be set for 1.2 volts at Pin 14 of IC20C. Too extreme an adjustment will result in the loss of the Pedal Wow effect.

SCHEMATIC 12

VR27 CLOCK 1 SPEED ADJUSTMENT

This adjustment is set at the factory for 19 Hz. Readjustment should only be necessary when circuit components are replaced. Extreme adjustment will result in the loss of chorus effect.

VR26 CLOCK 2 SPEED ADJUSTMENT

This adjustment is set at the factory for 2.2 Hz. Readjustment should only be necessary when circuit components are replaced. Extreme adjustment will result in the loss of chorus effect.

VR28, VR29 AND VR30 PHASE 1, 2 AND 3 LEVEL ADJUSTMENT

These adjustments affect the volume of the Phase 1, 2 and 3 outputs. The output volume of each phase should be equal. The combined output of the three phases should equal the Flute volume with the chorus switch off.

SCHEMATIC 13

VR33 AOC RANGE ADJUSTMENT

This adjustment regulates the voltage supply to the AOC keyers, thereby adjusting the AOC range. Too extreme an adjustment will cause dissonant chords when playing AOC.

SCHEMATIC 14

L13 CHORD TUNING COIL

First, tune L1 as described above. Then turn off the Magic Chord tab and all Rhythm tabs. Turn on only the Lower Keyboard String Bass voice and Upper Keyboard Kinura voice. Now, holding a C on both the Upper and Lower Keyboards, adjust Tuning Coil L13 until no roll or beat is heard between the two notes.

NOTE: When tuning, always make sure all vibrato and vibrato pre-set voices are off.

VR40 CHORD LEVEL ADJUSTMENT

With the Magic Chord tab off, hold a three-note left-hand chord; switch the Magic Chord tab on and hold the same chord, but as a Genie one-note chord. Adjust VR40 until the volume level of the chord is the same with the Magic Chord tab on or off.

ADJUSTMENTS

SCHEMATIC 20

VR54 CHORUS SPEED OSCILLATOR ADJUSTMENT

This adjustment regulates the frequency of the Chorus Speed Oscillator. The factory setting is .7 Hz; too extreme an adjustment will result in the loss of chorus effect on the Orchestral Symphonizer presets.

VR53 BIAS ADJUSTMENT

This adjustment adjusts the bias voltage for the Bucket Brigade IC140. With the French Horn preset on and a chord held, turn VR53 in both directions until distortion occurs. Proper setting is the midpoint between the distortion regions.

SCHEMATIC 23

VR64 MINIMUM ORGAN ADJUSTMENT

Set this adjustment by turning only the Flute 8 tab on. Hold down a key with the expression shoe at minimum expression and turn VR64 until the note being held can just be heard.

VR63 MAXIMUM ORGAN ADJUSTMENT

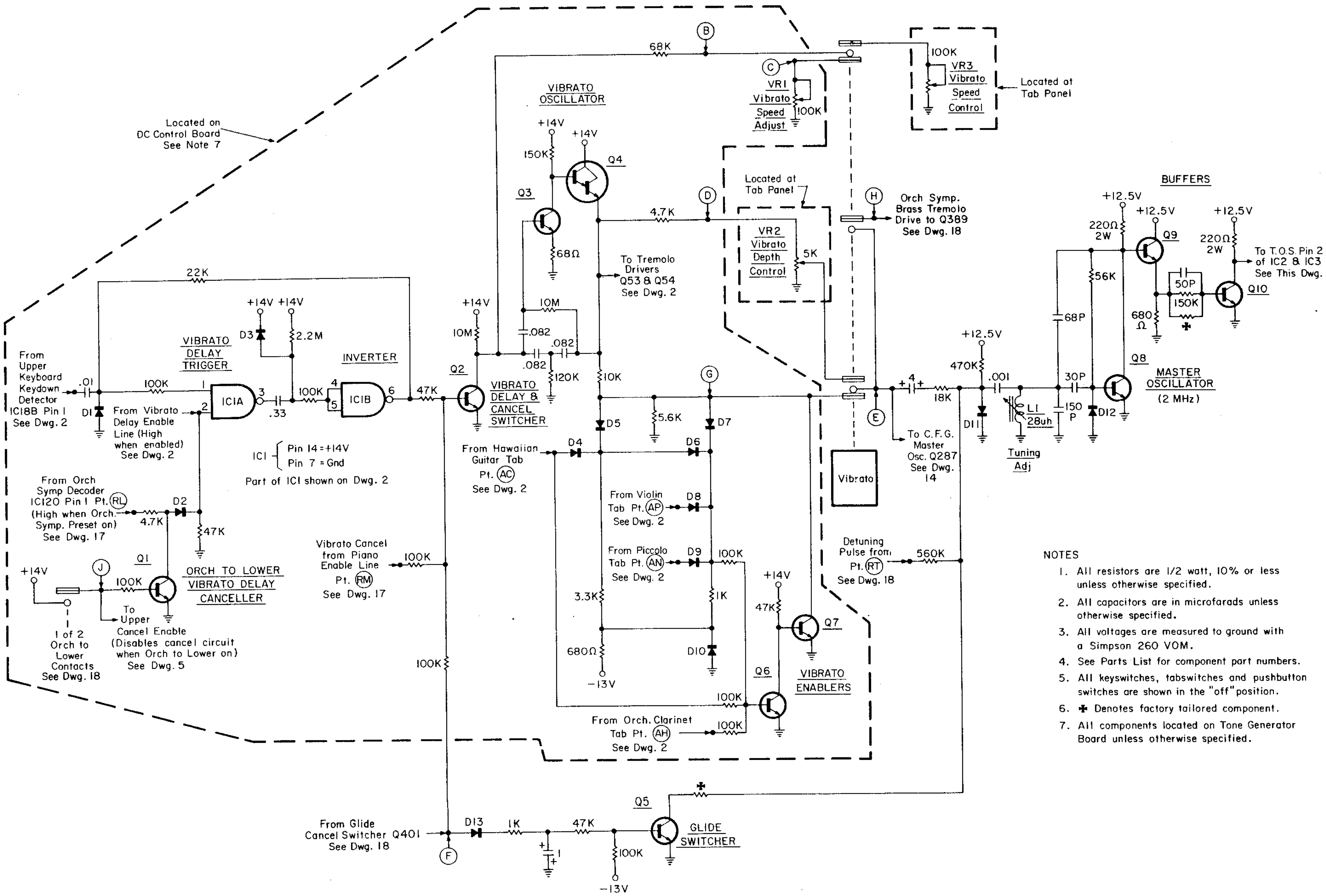
This adjustment is factory-set for maximum output at full expression shoe. Adjustment of VR63 effects only the maximum volume level of the organ and does not effect the minimum adjustment setting.

SCHEMATIC 24

VR67 VOLTAGE ADJUSTMENT

VR67 adjusts the DC voltage outputted from IC173 and should be set for 14 volts at IC173 Pin 2.

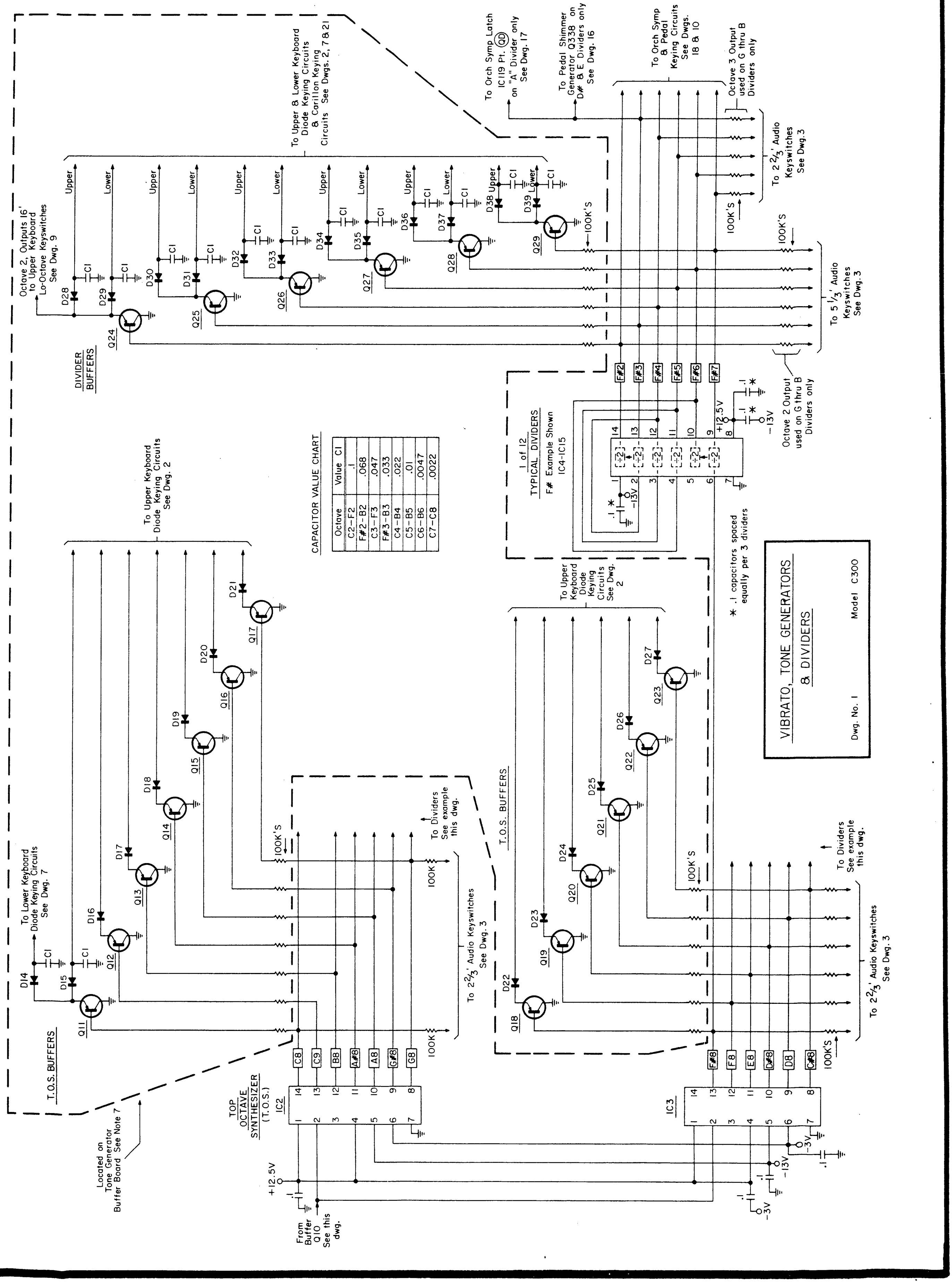
SCHEMATIC 1


BUFFERS
+12.5V
220Ω 2W
Q9
Q10
50P
150K
680 Ω
To T.O.S. Pin 2 of IC2 & IC3 See This Dwg.
Q8
MASTER OSCILLATOR (2 MHz)
56K
68P
30P
150 P
D12
L1 28uh
Tuning Adj
470K
.001
D11
18K
4
To C.F.G. Master Osc. Q287 See Dwg. 14
E
H
Orch Symp. Brass Tremolo Drive to Q389 See Dwg. 18
Vibrato
100K
VR3 Vibrato Speed Control
Located at Tab Panel
C
VR1 Vibrato Speed Adjust
B
68K
Located at Tab Panel
VR2 Vibrato Depth Control
5K
D
4.7K
VIBRATO OSCILLATOR
+14V
150K
Q4
Q3
68Ω
To Tremolo Drivers Q53 & Q54 See Dwg. 2
10M
.082
120K
10K
Q2
VIBRATO DELAY & CANCEL SWITCHER
G
D5
5.6K
D7
D4
D6
From Hawaiian Guitar Tab Pt. AC See Dwg. 2
From Violin Tab Pt. AP See Dwg. 2
D8
From Piccolo Tab Pt. AN See Dwg. 2
D9
100K
1K
3.3K
680Ω
D10
-13V
47K
Q7
Q6
VIBRATO ENABLERS
From Orch. Clarinet Tab Pt. AH See Dwg. 2
Detuning Pulse from Pt. RT See Dwg. 18
560K
Located on DC Control Board See Note 7
22K
From Upper Keyboard Keydown Detector IC18B Pin 1 See Dwg. 2
.01
D1
From Vibrato Delay Enable Line (High when enabled) See Dwg. 2
VIBRATO DELAY TRIGGER
IC1A
D3
2.2M
.33
INVERTER
IC1B
IC1 { Pin 14 = +14V Pin 7 = Gnd
Part of IC1 shown on Dwg. 2
From Orch Symp Decoder IC120 Pin 1 Pt. RL (High when Orch. Symp. Preset on) See Dwg. 17
D2
Q1
J
ORCH TO LOWER VIBRATO DELAY CANCELLER
To Upper Cancel Enable (Disables cancel circuit when Orch to Lower on) See Dwg. 5
1 of 2 Orch to Lower Contacts See Dwg. 18
Vibrato Cancel from Piano Enable Line Pt. RM See Dwg. 17
From Glide Cancel Switcher Q401 See Dwg. 18
F
D13
Q5
GLIDE SWITCHER
1
-13V

NOTES

1. All resistors are 1/2 watt, 10% or less unless otherwise specified.
2. All capacitors are in microfarads unless otherwise specified.
3. All voltages are measured to ground with a Simpson 260 VOM.
4. See Parts List for component part numbers.
5. All keyswitches, tabswitches and pushbutton switches are shown in the "off" position.
6. ✚ Denotes factory tailored component.
7. All components located on Tone Generator Board unless otherwise specified.

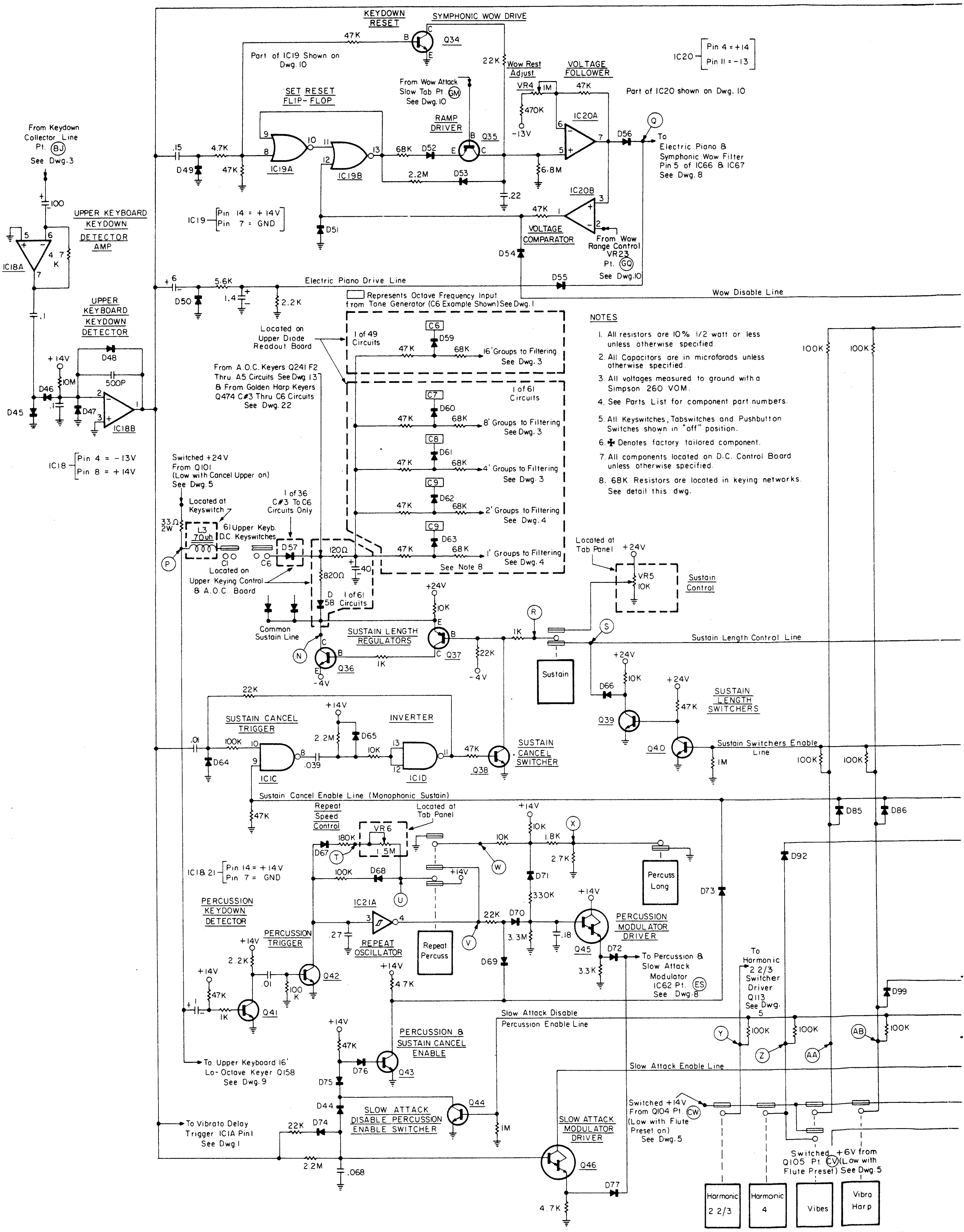
SCHEMATIC 1


VIBRATO, TONE GENERATORS & DIVIDERS
Dwg. No. 1
Model C300
To Upper & Lower Keyboard Diode Keying Circuits & Carillon Keying Circuits See Dwgs. 2, 7 & 21
To Orch Symp Latch IC119 Pt. Ⓓ on "A" Divider only See Dwg. 17
To Pedal Shimmer Generator Q338 on D# & E Dividers only See Dwg. 16
To Orch Symp & Pedal Keying Circuits See Dwgs. 18 & 10
Octave 3 Output used on G thru B Dividers only
To 2 2/3' Audio Keyswitches See Dwg. 3
To 5 1/3' Audio Keyswitches See Dwg. 3
Octave 2 Output used on G thru B Dividers only
Octave 2, Outputs 16' to Upper Keyboard Lo-Octave Keyswitches See Dwg. 9
DIVIDER BUFFERS
Upper
Lower
C1
100K'S
D28
D29
D30
D31
D32
D33
D34
D35
D36
D37
D38
D39
Q24
Q25
Q26
Q27
Q28
Q29
F#2
F#3
F#4
F#5
F#6
F#7
+12.5V
-13V
1 of 12 TYPICAL DIVIDERS
F# Example Shown
IC4-IC15
÷2
* .1 capacitors spaced equally per 3 dividers
To Upper Keyboard Diode Keying Circuits See Dwg. 2
To Lower Keyboard Diode Keying Circuits See Dwg. 7
T.O.S. BUFFERS
D14
D15
D16
D17
D18
D19
D20
D21
D22
D23
D24
D25
D26
D27
Q11
Q12
Q13
Q14
Q15
Q16
Q17
Q18
Q19
Q20
Q21
Q22
Q23
100K
To Dividers See example this dwg.
To 2 2/3' Audio Keyswitches See Dwg. 3
C8
C9
B8
A#8
A8
G#8
G8
F#8
F8
E8
D#8
D8
C#8
TOP OCTAVE SYNTHESIZER (T.O.S.)
IC2
IC3
-3V
+12.5V
From Buffer Q10 See this dwg.
Located on Tone Generator Buffer Board See Note 7

CAPACITOR VALUE CHART

Octave	Value C1
C2-F2	.1
F#2-B2	.068
C3-F3	.047
F#3-B3	.033
C4-B4	.022
C5-B5	.01
C6-B6	.0047
C7-C8	.0022

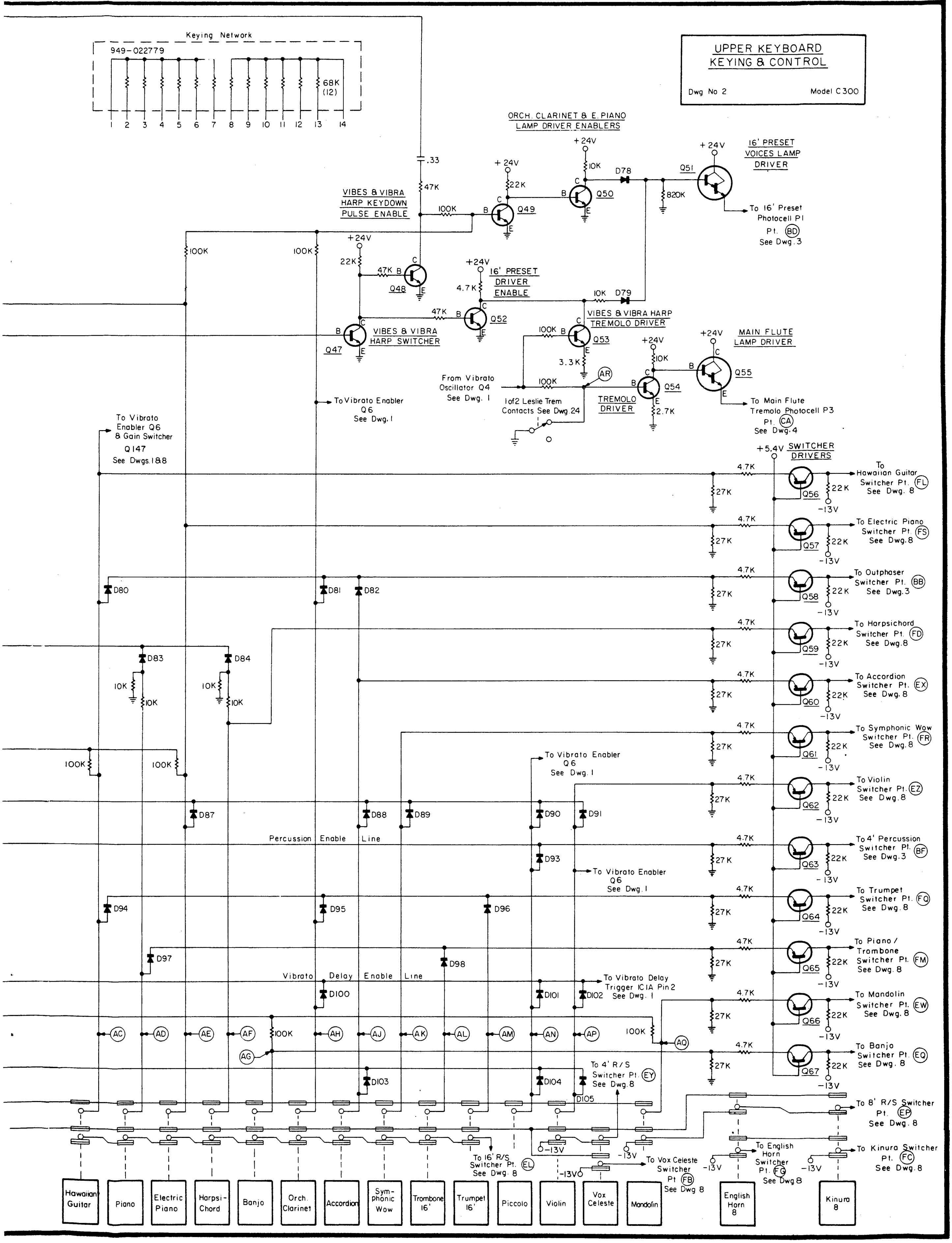
SCHEMATIC 2


KEYDOWN RESET
SYMPHONIC WOW DRIVE
Q34
Part of IC19 Shown on Dwg. 10
22K
Wow Rest Adjust
VR4
1M
470K
-13V
VOLTAGE FOLLOWER
47K
IC20 Pin 4 = +14 Pin 11 = -13
Part of IC20 shown on Dwg. 10
IC20A
IC20B
D56
To Electric Piano & Symphonic Wow Filter Pin 5 of IC66 & IC67 See Dwg. 8
SET RESET FLIP-FLOP
From Wow Attack Slow Tab Pt GM See Dwg. 10
RAMP DRIVER
Q35
D52
68K
2.2M
D53
.22
6.8M
IC19A
IC19B
From Keydown Collector Line Pt. BJ See Dwg. 3
.15
4.7K
47K
D49
IC19 Pin 14 = +14V Pin 7 = GND
D51
VOLTAGE COMPARATOR
From Wow Range Control VR23 Pt. GQ See Dwg. 10
D54
D55
UPPER KEYBOARD KEYDOWN DETECTOR AMP
IC18A
.1
100
Electric Piano Drive Line
5.6K
1.4
2.2K
D50
Wow Disable Line
Represents Octave Frequency Input from Tone Generator (C6 Example Shown) See Dwg. 1
Located on Upper Diode Readout Board
1 of 49 Circuits
C6
D59
16' Groups to Filtering See Dwg. 3
1 of 61 Circuits
C7
D60
8' Groups to Filtering See Dwg. 3
C8
D61
4' Groups to Filtering See Dwg. 3
C9
D62
2' Groups to Filtering See Dwg. 4
D63
1' Groups to Filtering See Dwg. 4
See Note 8
UPPER KEYBOARD KEYDOWN DETECTOR
+14V
D48
10M
500P
D46
D47
D45
IC18B
IC18 Pin 4 = -13V Pin 8 = +14V
From A.O.C. Keyers Q241 F2 Thru A5 Circuits See Dwg 13 & From Golden Harp Keyers Q474 C#3 Thru C6 Circuits See Dwg. 22
Switched +24V From Q101 (Low with Cancel Upper on) See Dwg. 5
Located at Keyswitch
1 of 36 C#3 To C6 Circuits Only
33Ω 2W
L3 70uh
61 Upper Keyb. D.C. Keyswitches
D57
C1
C6
Located on Upper Keying Control & A.O.C. Board
120Ω
40
820Ω
D58 1 of 61 Circuits
Common Sustain Line
SUSTAIN LENGTH REGULATORS
Q36
Q37
1K
-4V
+24V
10K
22K
Located at Tab Panel
VR5 10K
Sustain Control
Sustain
Sustain Length Control Line
D66
Q39
SUSTAIN LENGTH SWITCHERS
Q40
1M
Sustain Switchers Enable Line
100K
SUSTAIN CANCEL TRIGGER
INVERTER
.01
100K
D64
IC1C
.039
2.2M
D65
IC1D
SUSTAIN CANCEL SWITCHER
Q38
Sustain Cancel Enable Line (Monophonic Sustain)
D85
D86
Repeat Speed Control
Located at Tab Panel
VR6
1.5M
180K
D67
D68
IC18 21 Pin 14 = +14V Pin 7 = GND
1.8K
2.7K
D71
330K
Percuss Long
D92
D73
PERCUSSION KEYDOWN DETECTOR
IC21A
.27
REPEAT OSCILLATOR
Repeat Percuss
D70
3.3M
.18
D69
PERCUSSION MODULATOR DRIVER
Q45
D72
3.3K
To Percussion & Slow Attack Modulator IC62 Pt. ES See Dwg. 8
To Harmonic 2 2/3 Switcher Driver Q113 See Dwg. 5
D99
PERCUSSION TRIGGER
Q42
Q41
To Upper Keyboard 16' Lo-Octave Keyer Q158 See Dwg. 9
Slow Attack Disable
Percussion Enable Line
PERCUSSION & SUSTAIN CANCEL ENABLE
Q43
D76
D75
D44
SLOW ATTACK DISABLE PERCUSSION ENABLE SWITCHER
Q44
To Vibrato Delay Trigger IC1A Pin 1 See Dwg. 1
D74
.068
Slow Attack Enable Line
SLOW ATTACK MODULATOR DRIVER
Q46
D77
4.7K
Switched +14V From Q104 Pt. CW (Low with Flute Preset on) See Dwg. 5
Switched +6V from Q105 Pt. CV (Low with Flute Preset) See Dwg. 5
Harmonic 2 2/3
Harmonic 4
Vibes
Vibra Harp

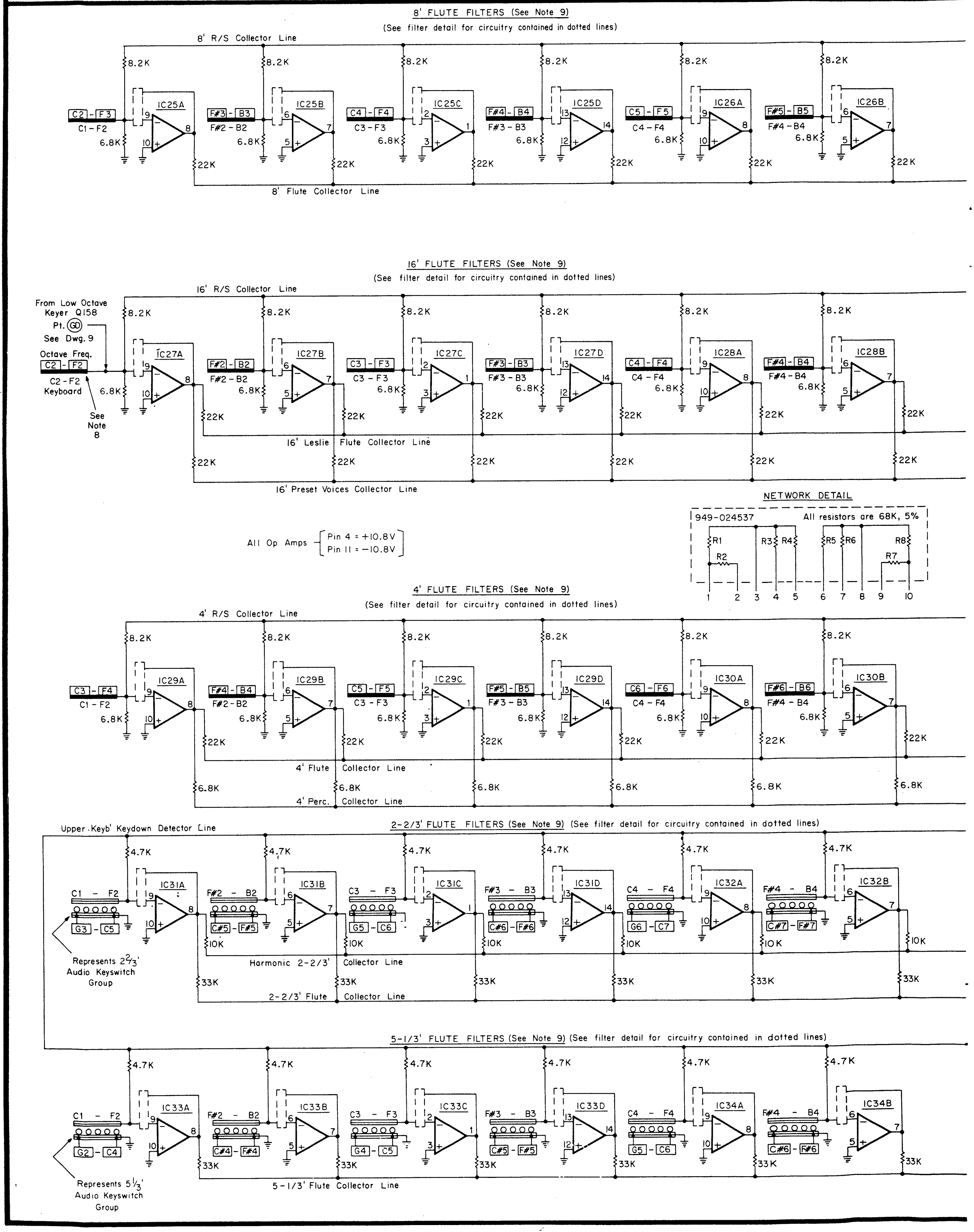
NOTES

1. All resistors are 10% 1/2 watt or less unless otherwise specified.
2. All Capacitors are in microfarads unless otherwise specified.
3. All voltages measured to ground with a Simpson 260 VOM.
4. See Parts List for component part numbers.
5. All Keyswitches, Tabswitches and Pushbutton Switches shown in "off" position.
6. ✠ Denotes factory tailored component.
7. All components located on D.C. Control Board unless otherwise specified.
8. 68K Resistors are located in keying networks. See detail this dwg.

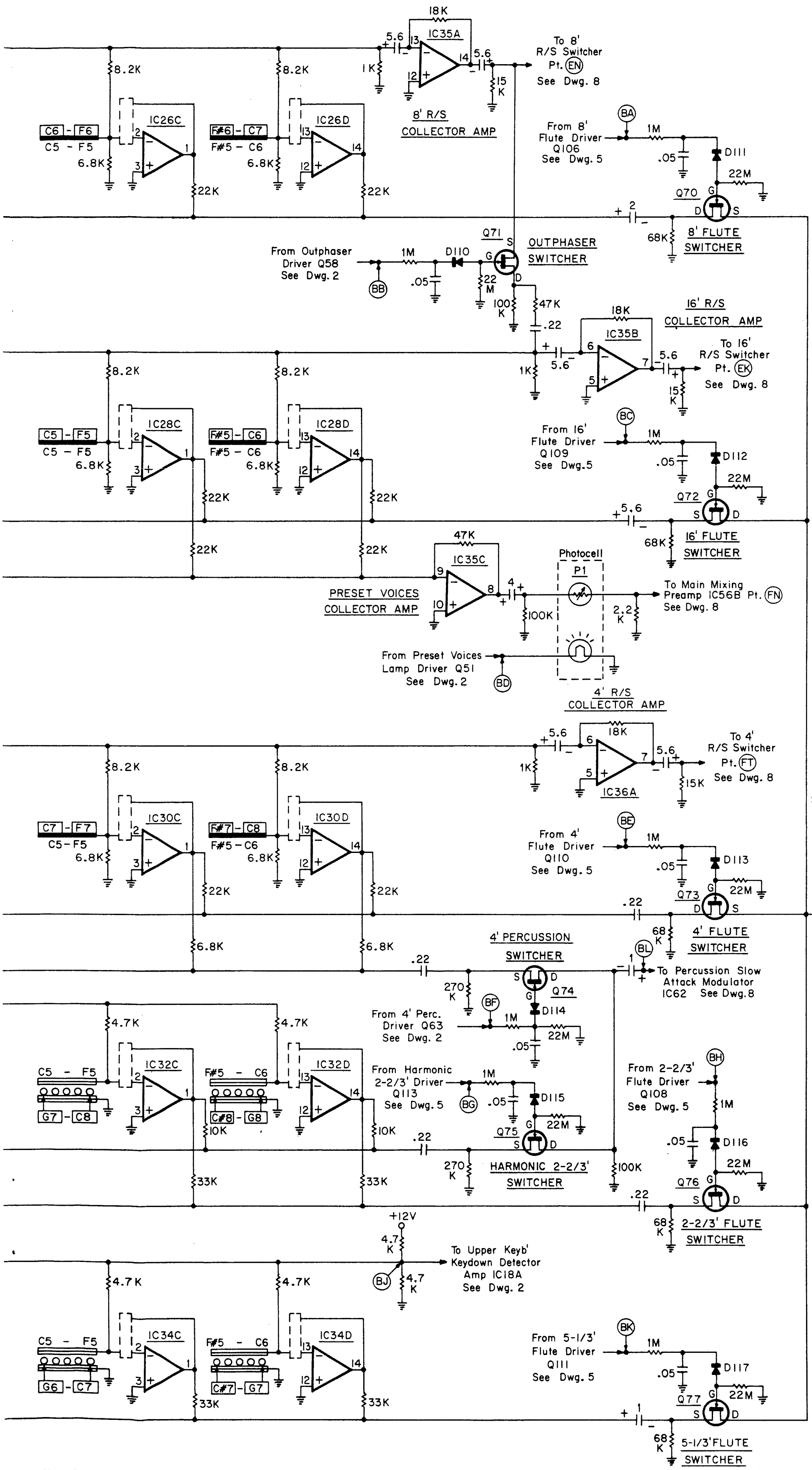
SCHEMATIC 2


UPPER KEYBOARD KEYING & CONTROL
Dwg No 2
Model C300
Keying Network
949-022779
68K (12)
1 2 3 4 5 6 7 8 9 10 11 12 13 14
ORCH. CLARINET & E. PIANO LAMP DRIVER ENABLERS
16' PRESET VOICES LAMP DRIVER
To 16' Preset Photocell P1 Pt. BD See Dwg. 3
VIBES & VIBRA HARP KEYDOWN PULSE ENABLE
16' PRESET DRIVER ENABLE
VIBES & VIBRA HARP TREMOLO DRIVER
VIBES & VIBRA HARP SWITCHER
MAIN FLUTE LAMP DRIVER
From Vibrato Oscillator Q4 See Dwg. 1
1 of 2 Leslie Trem Contacts See Dwg 24
TREMOLO DRIVER
To Main Flute Tremolo Photocell P3 Pt. CA See Dwg. 4
To Vibrato Enabler Q6 See Dwg. 1
To Vibrato Enabler Q6 & Gain Switcher Q147 See Dwgs. 1 & 8
Q47
Q48
Q49
Q50
Q51
Q52
Q53
Q54
Q55
D78
D79
AR
+24V
.33
47K
100K
22K
10K
4.7K
820K
3.3K
2.7K
SWITCHER DRIVERS
+5.4V
-13V
27K
To Hawaiian Guitar Switcher Pt. FL See Dwg. 8
Q56
To Electric Piano Switcher Pt. FS See Dwg. 8
Q57
To Outphaser Switcher Pt. BB See Dwg. 3
Q58
To Harpsichord Switcher Pt. FD See Dwg. 8
Q59
To Accordion Switcher Pt. EX See Dwg. 8
Q60
To Symphonic Wow Switcher Pt. FR See Dwg. 8
Q61
To Violin Switcher Pt. EZ See Dwg. 8
Q62
To 4' Percussion Switcher Pt. BF See Dwg. 3
Q63
To Trumpet Switcher Pt. FQ See Dwg. 8
Q64
To Piano / Trombone Switcher Pt. FM See Dwg. 8
Q65
To Mandolin Switcher Pt. EW See Dwg. 8
Q66
To Banjo Switcher Pt. EQ See Dwg. 8
Q67
D80
D81
D82
D83
D84
D87
D88
D89
D90
D91
D93
D94
D95
D96
D97
D98
D100
D101
D102
D103
D104
D105
Percussion Enable Line
Vibrato Delay Enable Line
To Vibrato Delay Trigger IC1A Pin 2 See Dwg. 1
To 4' R/S Switcher Pt. EY See Dwg. 8
AC
AD
AE
AF
AG
AH
AJ
AK
AL
AM
AN
AP
AQ
To 16' R/S Switcher Pt. EL See Dwg. 8
To Vox Celeste Switcher Pt FB See Dwg 8
To English Horn Switcher Pt. FG See Dwg 8
To 8' R/S Switcher Pt. EP See Dwg. 8
To Kinura Switcher Pt. FC See Dwg. 8
Hawaiian Guitar
Piano
Electric Piano
Harpsi-Chord
Banjo
Orch. Clarinet
Accordion
Sym-phonic Wow
Trombone 16'
Trumpet 16'
Piccolo
Violin
Vox Celeste
Mandolin
English Horn 8
Kinura 8

SCHEMATIC 3


8' FLUTE FILTERS (See Note 9)
(See filter detail for circuitry contained in dotted lines)
8' R/S Collector Line
8.2K
IC25A
IC25B
IC25C
IC25D
IC26A
IC26B
C2 - F3
C1 - F2
F#3 - B3
F#2 - B2
C4 - F4
C3 - F3
F#4 - B4
F#3 - B3
C5 - F5
C4 - F4
F#5 - B5
F#4 - B4
6.8K
22K
8' Flute Collector Line
16' FLUTE FILTERS (See Note 9)
(See filter detail for circuitry contained in dotted lines)
16' R/S Collector Line
From Low Octave Keyer Q158
Pt. GD
See Dwg. 9
Octave Freq.
C2 - F2
C2 - F2 Keyboard
See Note 8
IC27A
IC27B
IC27C
IC27D
IC28A
IC28B
F#2 - B2
C3 - F3
F#3 - B3
C4 - F4
F#4 - B4
16' Leslie Flute Collector Line
16' Preset Voices Collector Line
NETWORK DETAIL
949-024537
All resistors are 68K, 5%
R1
R2
R3
R4
R5
R6
R7
R8
1
2
3
4
5
6
7
8
9
10
All Op Amps
Pin 4 = +10.8V
Pin 11 = −10.8V
4' FLUTE FILTERS (See Note 9)
(See filter detail for circuitry contained in dotted lines)
4' R/S Collector Line
IC29A
IC29B
IC29C
IC29D
IC30A
IC30B
C3 - F4
C1 - F2
F#4 - B4
F#2 - B2
C5 - F5
C3 - F3
F#5 - B5
F#3 - B3
C6 - F6
C4 - F4
F#6 - B6
F#4 - B4
4' Flute Collector Line
4' Perc. Collector Line
Upper Keyb' Keydown Detector Line
2-2/3' FLUTE FILTERS (See Note 9) (See filter detail for circuitry contained in dotted lines)
4.7K
IC31A
IC31B
IC31C
IC31D
IC32A
IC32B
C1 - F2
G3 - C5
F#2 - B2
C#5 - F#5
C3 - F3
G5 - C6
F#3 - B3
C#6 - F#6
C4 - F4
G6 - C7
F#4 - B4
C#7 - F#7
10K
33K
Represents 2⅔' Audio Keyswitch Group
Harmonic 2-2/3' Collector Line
2-2/3' Flute Collector Line
5-1/3' FLUTE FILTERS (See Note 9) (See filter detail for circuitry contained in dotted lines)
IC33A
IC33B
IC33C
IC33D
IC34A
IC34B
G2 - C4
C#4 - F#4
G4 - C5
C#5 - F#5
G5 - C6
C#6 - F#6
Represents 5⅓' Audio Keyswitch Group
5-1/3' Flute Collector Line

SCHEMATIC 3


18K
5.6
IC35A
13
12
14
5.6
1K
15 K
To 8' R/S Switcher Pt. EN See Dwg. 8
8' R/S COLLECTOR AMP
8.2K
8.2K
C6 - F6
C5 - F5
6.8K
IC26C
F#6 - C7
F#5 - C6
6.8K
IC26D
22K
22K
BA
From 8' Flute Driver Q106 See Dwg. 5
1M
.05
D111
22M
Q70
8' FLUTE SWITCHER
68K
2
From Outphaser Driver Q58 See Dwg. 2
BB
1M
D110
.05
22 M
Q71
OUTPHASER SWITCHER
100 K
47K
.22
18K
IC35B
16' R/S COLLECTOR AMP
To 16' R/S Switcher Pt. EK See Dwg. 8
5.6
5.6
1K
15 K
8.2K
8.2K
IC28C
IC28D
C5 - F5
C5 - F5
6.8K
F#5 - C6
F#5 - C6
6.8K
22K
22K
BC
From 16' Flute Driver Q109 See Dwg.5
1M
.05
D112
22M
Q72
5.6
16' FLUTE SWITCHER
68K
22K
22K
47K
IC35C
PRESET VOICES COLLECTOR AMP
4
100K
Photocell
P1
To Main Mixing Preamp IC56B Pt. FN See Dwg. 8
2.2 K
From Preset Voices Lamp Driver Q51 See Dwg. 2
BD
4' R/S COLLECTOR AMP
5.6
18K
IC36A
1K
5.6
To 4' R/S Switcher Pt. FT See Dwg. 8
15K
8.2K
8.2K
IC30C
IC30D
C7 - F7
C5-F5
6.8K
F#7 - C8
F#5-C6
6.8K
22K
22K
BE
From 4' Flute Driver Q110 See Dwg. 5
1M
.05
D113
22M
Q73
.22
4' FLUTE SWITCHER
68 K
6.8K
6.8K
.22
4' PERCUSSION SWITCHER
Q74
270 K
BF
From 4' Perc. Driver Q63 See Dwg. 2
1M
D114
22M
.05
BL
1
To Percussion Slow Attack Modulator IC62 See Dwg.8
4.7K
4.7K
IC32C
IC32D
C5 - F5
G7 - C8
F#5 - C6
C#8 - G8
From Harmonic 2-2/3' Driver Q113 See Dwg. 5
1M
BG
.05
D115
22M
Q75
10K
10K
.22
270 K
HARMONIC 2-2/3' SWITCHER
100K
BH
From 2-2/3' Flute Driver Q108 See Dwg. 5
1M
.05
D116
22M
Q76
.22
2-2/3' FLUTE SWITCHER
68 K
33K
33K
+12V
4.7 K
BJ
4.7 K
To Upper Keyb' Keydown Detector Amp IC18A See Dwg. 2
4.7K
4.7K
IC34C
IC34D
C5 - F5
G6 - C7
F#5 - C6
C#7 - G7
33K
33K
BK
From 5-1/3' Flute Driver Q111 See Dwg. 5
1M
.05
D117
22M
Q77
1
5-1/3' FLUTE SWITCHER
68 K
To Flute Mixing Preamp IC46A Pt. BU See Dwg. 4

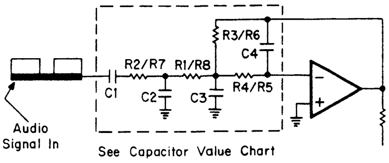
C2, C3 & C4 are 5% tolerance

Capacitor Value Chart

	Group Octave Freq. Range	C1	C2	C3	C4
4', 8' & 16' Groups	C2-F2	.22	.1	.15	.0047
	F#2-B2	.12	.075	.1	.0033
	C3-F3	.068	.05	.075	.0022
	F#3-B3	.047	.039	.056	.0015
	C4-F4	.039	.027	.039	.001
	F#4-B4	.015	.02	.027	750P
	C5-F5	.01	.014	.02	560P
	F#5-C6	.0082	.01	.014	390P
	C2-F3	.068	.05	.075	.0022
	F#5-B5	.0082	.01	.014	390P
	C6-F6	.0068	.0068	.01	270P
	F#6-C7	.0047	.0047	.0068	200P
	C3-F4	.039	.027	.039	.001
	F#6-B6	.0047	.0047	.0068	200P
	C7-F7	.0033	.0033	.0047	130P
	F#7-C8	.0022	.0024	.0033	82P
2-2/3' & 5-1/3' Groups	G2-C4	.047	.039	.056	.0015
	C#4-F#4	.02	.027	.039	.001
	G4-C5	.02	.02	.027	750P
	C#5-F#5	.01	.014	.02	560P
	G5-C6	.01	.01	.014	390P
	C#6-F#6	.0068	.0068	.01	270P
	G6-C7	.0068	.0047	.0068	200P
	C#7-G7	.0047	.0033	.0047	130P
	G3-C5	.039	.02	.027	750P
	C#7-F#7	.0047	.0033	.0047	130P
	G7-C8	.0047	.0024	.0033	82P
	C#8-G8	.0039	.0016	.0024	68P

FILTER DETAIL

All resistors with "R" No's are contained in network.


R3/R6
C4
R2/R7
R1/R8
R4/R5
C1
C2
C3
Audio Signal In

See Capacitor Value Chart

NOTES

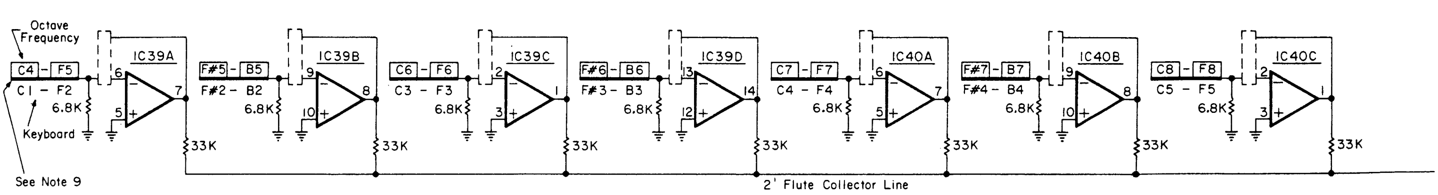
1. All resistors are 10%, 1/2 watt or less unless otherwise specified.
2. All Capacitors are in microfarads unless otherwise specified.
3. All voltages measured to ground with a Simpson 260 VOM.
4. See Parts List for component part numbers.
5. All Keyswitches, Tabswitches and Pushbutton Switches shown in "off" position.
6. ✚ Denotes factory tailored component.
7. All components located on Upper Flute Symp. String Filter Board unless otherwise specified.
8. Bold lines indicate Diode Keying Groups, one note example shown on Dwg. 2.
9. See Filter Detail for circuitry contained in dotted lines.

UPPER KEYBOARD 2-2/3', 4', 5-1/3', 8' & 16' FLUTE FILTERS & SWITCHING

Dwg. No. 3 Model C300

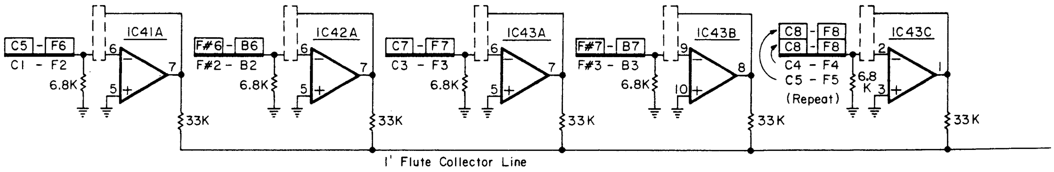
SCHEMATIC 4

2' FLUTE FILTERS (See Note 8)


Octave Frequency
Keyboard
See Note 9
C4 - F5
C1 - F2
6.8K
IC39A
F#5 - B5
F#2 - B2
IC39B
C6 - F6
C3 - F3
IC39C
F#6 - B6
F#3 - B3
IC39D
C7 - F7
C4 - F4
IC40A
F#7 - B7
F#4 - B4
IC40B
C8 - F8
C5 - F5
IC40C
33K
2' Flute Collector Line

All Op Amps — Pin 4 = +10.8V, Pin 11 = −10.8V

1' FLUTE FILTERS (See Note 8)


C5 - F6
C1 - F2
IC41A
F#6 - B6
F#2 - B2
IC42A
C7 - F7
C3 - F3
IC43A
F#7 - B7
F#3 - B3
IC43B
C8 - F8
C8 - F8
C4 - F4
C5 - F5
(Repeat)
IC43C
6.8K
33K
1' Flute Collector Line

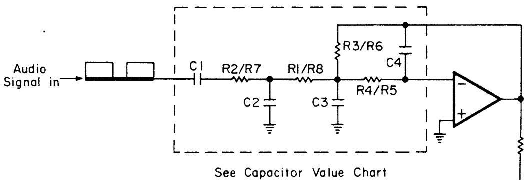
Group Octave Freq. Range		C1	C2	C3	C4
Upper Keyboard 1' & 2' Groups	C4-F5	.01	.014	.02	560P
	F#5-B5	.0082	.01	.014	390P
	C6-F6	.0068	.0068	.01	270P
	F#6-B6	.0047	.0047	.0068	200P
	C7-F7	.0033	.0033	.0047	130P
	F#7-B7	.0022	.0024	.0033	82P
	C8-F8	.0018	.0016	.0024	68P
	F#8-C9	.0018	.0012	.0016	47P
	C5-F6	.0068	.0068	.01	270P
Lower Keyboard 4' & 8' Groups	C2-F3	.047	.039	.056	.0015
	F#3-B3	.039	.033	.039	.0012
	C4-F4	.015	.02	.027	750P
	F#4-B4	.01	.014	.02	560P
	C5-F5	.0082	.01	.014	390P
	F#5-B5	.0068	.0068	.01	270P
	C6-C7	.0047	.0047	.0068	200P
	C3-F4	.015	.025	.027	750P
	C6-F6	.0047	.0047	.0068	200P
	F#6-B6	.0033	.0033	.0047	130P
	C7-C8	.0022	.0024	.0033	82P

Capacitor Value Chart

C2, C3 & C4 are 5% tolerance

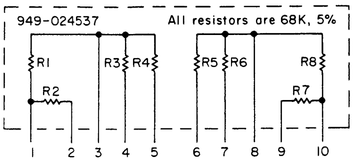
FILTER DETAIL

All resistors with "R" nos. are contained in network.

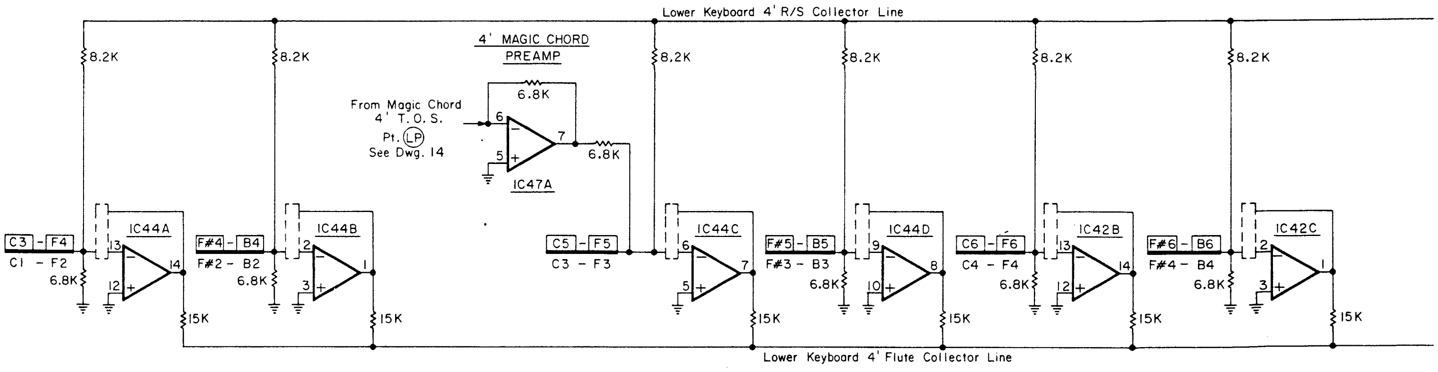

Audio Signal in
C1
R2/R7
R1/R8
R3/R6
C4
R4/R5
C2
C3

See Capacitor Value Chart

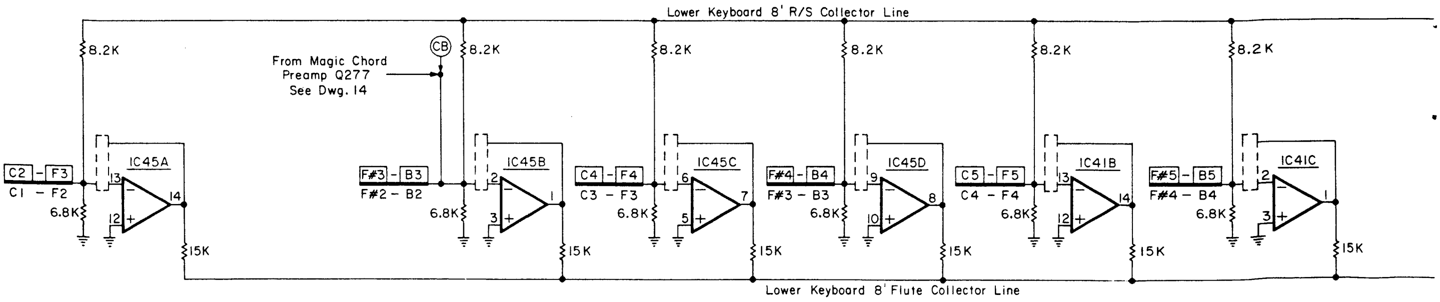
NETWORK DETAIL


949-024537
All resistors are 68K, 5%
R1
R2
R3
R4
R5
R6
R7
R8
1
2
3
4
5
6
7
8
9
10

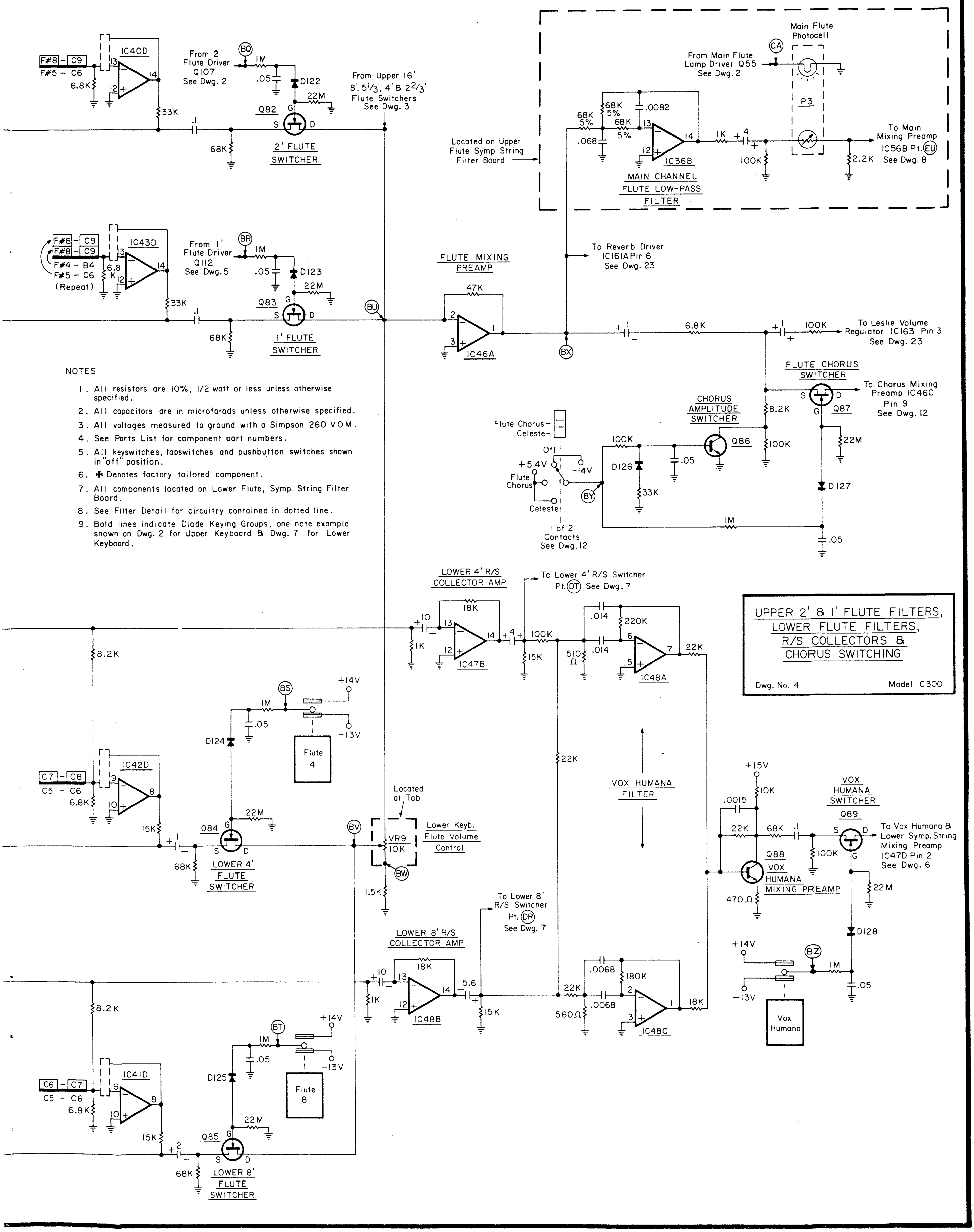
LOWER KEYBOARD 4' FLUTE FILTERS (See Note 8)


Lower Keyboard 4' R/S Collector Line
8.2K
4' MAGIC CHORD PREAMP
6.8K
From Magic Chord 4' T.O.S. Pt. LP See Dwg. 14
IC47A
C3 - F4
C1 - F2
IC44A
F#4 - B4
F#2 - B2
IC44B
C5 - F5
C3 - F3
IC44C
F#5 - B5
F#3 - B3
IC44D
C6 - F6
C4 - F4
IC42B
F#6 - B6
F#4 - B4
IC42C
15K
Lower Keyboard 4' Flute Collector Line

LOWER KEYBOARD 8' FLUTE FILTERS (See Note 8)


Lower Keyboard 8' R/S Collector Line
8.2K
From Magic Chord Preamp Q277 See Dwg. 14
CB
C2 - F3
C1 - F2
IC45A
F#3 - B3
F#2 - B2
IC45B
C4 - F4
C3 - F3
IC45C
F#4 - B4
F#3 - B3
IC45D
C5 - F5
C4 - F4
IC41B
F#5 - B5
F#4 - B4
IC41C
6.8K
15K
Lower Keyboard 8' Flute Collector Line

SCHEMATIC 4


IC40D
F#8 - C9
F#5 - C6
6.8K
13
12
14
33K
From 2' Flute Driver Q107 See Dwg. 2
BQ
1M
.05
D122
22M
Q82
G
S
D
.1
68K
2' FLUTE SWITCHER
From Upper 16' 8', 5 1/3', 4' & 2 2/3' Flute Switchers See Dwg. 3
Main Flute Photocell
CA
From Main Flute Lamp Driver Q55 See Dwg. 2
P3
68K 5%
68K 5%
.0082
68K 5%
.068
IC36B
1K
4
100K
2.2K
To Main Mixing Preamp IC56B Pt. EU See Dwg. 8
Located on Upper Flute Symp String Filter Board
MAIN CHANNEL FLUTE LOW-PASS FILTER
IC43D
F#8 - C9
F#8 - C9
F#4 - B4
F#5 - C6
(Repeat)
6.8 K
From 1' Flute Driver Q112 See Dwg. 5
BR
D123
Q83
1' FLUTE SWITCHER
BU
FLUTE MIXING PREAMP
47K
IC46A
To Reverb Driver IC161A Pin 6 See Dwg. 23
BX
6.8K
100K
To Leslie Volume Regulator IC163 Pin 3 See Dwg. 23
FLUTE CHORUS SWITCHER
To Chorus Mixing Preamp IC46C Pin 9 See Dwg. 12
Q87
8.2K
100K
22M
D127
CHORUS AMPLITUDE SWITCHER
Q86
Flute Chorus - Celeste -
Off
+5.4V
-14V
Flute Chorus
Celeste
BY
D126
33K
.05
1M
1 of 2 Contacts See Dwg. 12
LOWER 4' R/S COLLECTOR AMP
To Lower 4' R/S Switcher Pt. DT See Dwg. 7
18K
10
1K
IC47B
15K
.014
220K
510 Ω
IC48A
22K
8.2K
BS
+14V
-13V
Flute 4
D124
IC42D
C7 - C8
C5 - C6
15K
22M
Q84
LOWER 4' FLUTE SWITCHER
BV
Located at Tab
VR9 10K
Lower Keyb. Flute Volume Control
BW
1.5K
VOX HUMANA FILTER
+15V
10K
.0015
Q88
VOX HUMANA MIXING PREAMP
470 Ω
VOX HUMANA SWITCHER
Q89
To Vox Humana & Lower Symp. String Mixing Preamp IC47D Pin 2 See Dwg. 6
D128
BZ
Vox Humana
To Lower 8' R/S Switcher Pt. DR See Dwg. 7
LOWER 8' R/S COLLECTOR AMP
IC48B
5.6
.0068
180K
560 Ω
IC48C
BT
Flute 8
D125
IC41D
C6 - C7
Q85
LOWER 8' FLUTE SWITCHER

NOTES

1. All resistors are 10%, 1/2 watt or less unless otherwise specified.
2. All capacitors are in microfarads unless otherwise specified.
3. All voltages measured to ground with a Simpson 260 VOM.
4. See Parts List for component part numbers.
5. All keyswitches, tabswitches and pushbutton switches shown in "off" position.
6. ✠ Denotes factory tailored component.
7. All components located on Lower Flute, Symp. String Filter Board.
8. See Filter Detail for circuitry contained in dotted line.
9. Bold lines indicate Diode Keying Groups, one note example shown on Dwg. 2 for Upper Keyboard & Dwg. 7 for Lower Keyboard.

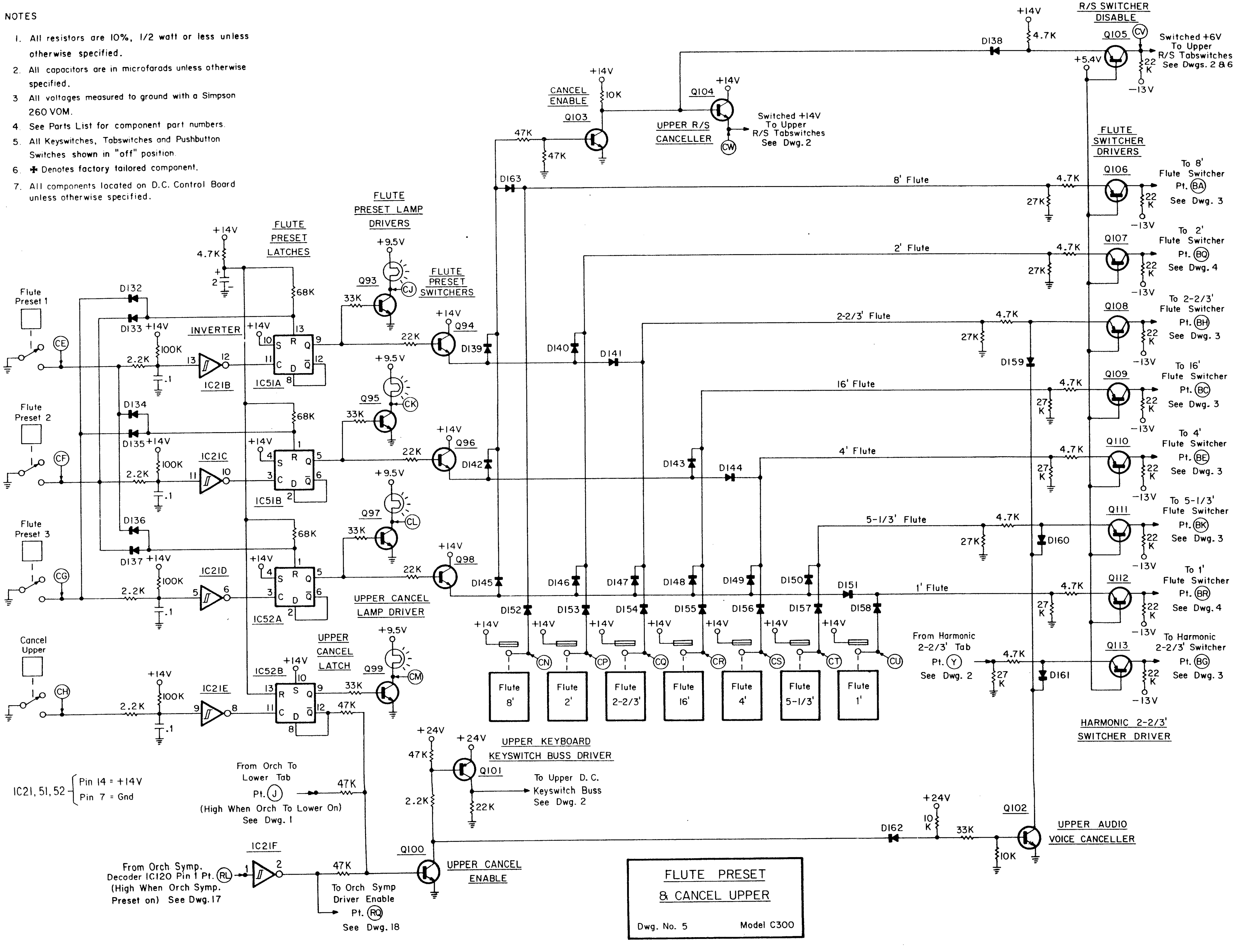
UPPER 2' & 1' FLUTE FILTERS,
LOWER FLUTE FILTERS,
R/S COLLECTORS &
CHORUS SWITCHING

Dwg. No. 4 Model C300

SCHEMATIC 5

NOTES

1. All resistors are 10%, 1/2 watt or less unless otherwise specified.
2. All capacitors are in microfarads unless otherwise specified.
3. All voltages measured to ground with a Simpson 260 VOM.
4. See Parts List for component part numbers.
5. All Keyswitches, Tabswitches and Pushbutton Switches shown in "off" position.
6. ✚ Denotes factory tailored component.
7. All components located on D.C. Control Board unless otherwise specified.



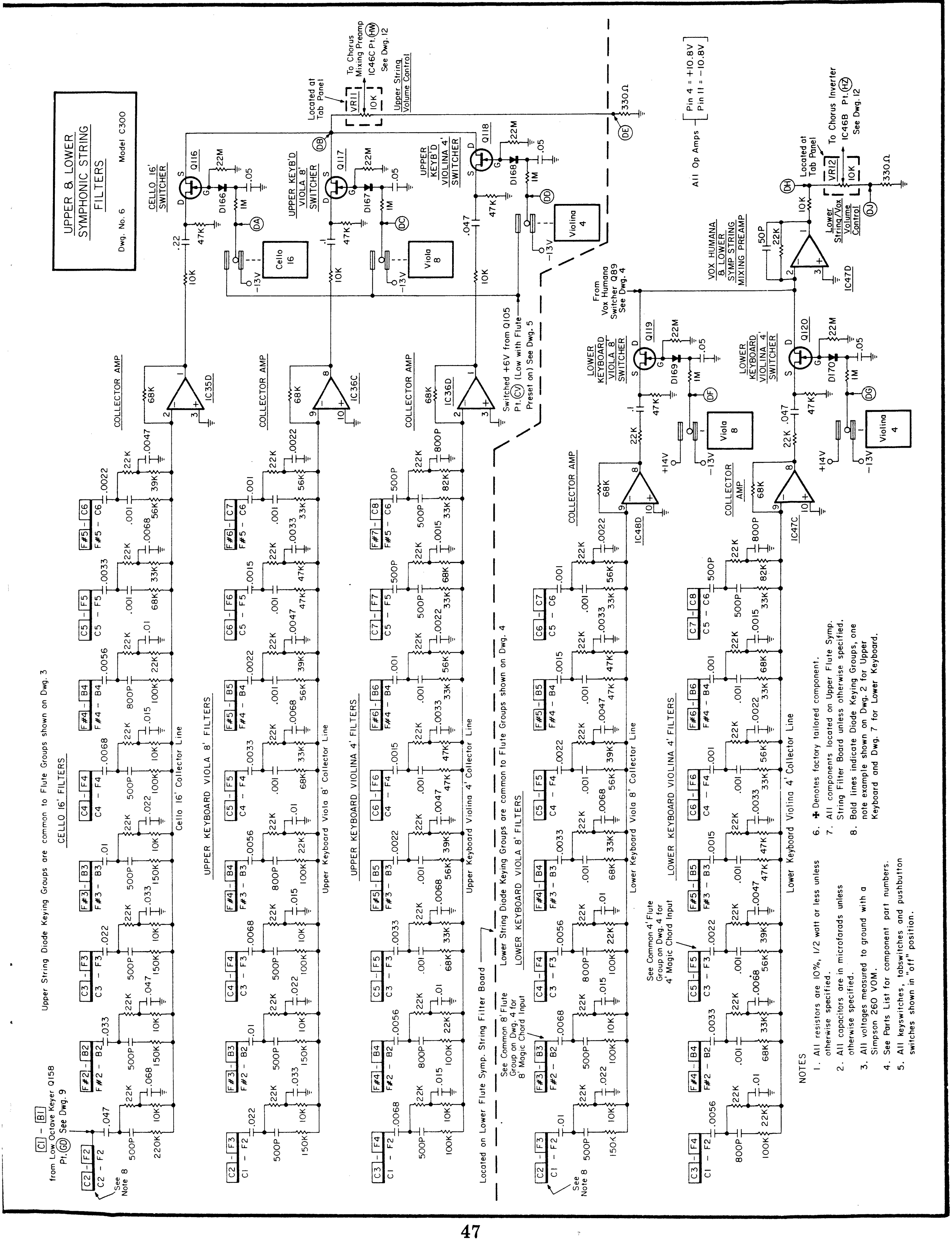
R/S SWITCHER DISABLE
Q105
CV
Switched +6V To Upper R/S Tabswitches See Dwgs. 2 & 6
+5.4V
D138
+14V
4.7K
CANCEL ENABLE
Q103
10K
47K
Q104
UPPER R/S CANCELLER
Switched +14V To Upper R/S Tabswitches See Dwg. 2
CW
FLUTE SWITCHER DRIVERS
Q106
To 8' Flute Switcher Pt. BA See Dwg. 3
Q107
To 2' Flute Switcher Pt. BQ See Dwg. 4
Q108
To 2-2/3' Flute Switcher Pt. BH See Dwg. 3
Q109
To 16' Flute Switcher Pt. BC See Dwg. 3
Q110
To 4' Flute Switcher Pt. BE See Dwg. 3
Q111
To 5-1/3' Flute Switcher Pt. BK See Dwg. 3
Q112
To 1' Flute Switcher Pt. BR See Dwg. 4
Q113
To Harmonic 2-2/3' Switcher Pt. BG See Dwg. 3
HARMONIC 2-2/3' SWITCHER DRIVER
22K
-13V
27K
8' Flute
2' Flute
2-2/3' Flute
16' Flute
4' Flute
5-1/3' Flute
1' Flute
D159
D160
D161
From Harmonic 2-2/3' Tab Pt. Y See Dwg. 2
FLUTE PRESET LATCHES
FLUTE PRESET LAMP DRIVERS
FLUTE PRESET SWITCHERS
Flute Preset 1
Flute Preset 2
Flute Preset 3
Cancel Upper
CE
CF
CG
CH
D132
D133
D134
D135
D136
D137
100K
2.2K
.1
INVERTER
IC21B
IC21C
IC21D
IC21E
IC21F
IC51A
IC51B
IC52A
IC52B
68K
+9.5V
Q93
Q95
Q97
Q99
CJ
CK
CL
CM
33K
Q94
Q96
Q98
D139
D140
D141
D142
D143
D144
D145
D146
D147
D148
D149
D150
D151
D152
D153
D154
D155
D156
D157
D158
D163
CN
CP
CQ
CR
CS
CT
CU
Flute 8'
Flute 2'
Flute 2-2/3'
Flute 16'
Flute 4'
Flute 5-1/3'
Flute 1'
UPPER CANCEL LAMP DRIVER
UPPER CANCEL LATCH
UPPER KEYBOARD KEYSWITCH BUSS DRIVER
Q101
+24V
To Upper D.C. Keyswitch Buss See Dwg. 2
From Orch To Lower Tab Pt. J (High When Orch To Lower On) See Dwg. 1
From Orch Symp. Decoder IC120 Pin 1 Pt. RL (High When Orch Symp. Preset on) See Dwg. 17
To Orch Symp Driver Enable Pt. RQ See Dwg. 18
Q100
UPPER CANCEL ENABLE
D162
Q102
UPPER AUDIO VOICE CANCELLER
10K

IC21, 51, 52 { Pin 14 = +14V
Pin 7 = Gnd

FLUTE PRESET
& CANCEL UPPER

Dwg. No. 5 Model C300

SCHEMATIC 6



CELLO 16' SWITCHER
Q116
D166
DA
Cello 16
UPPER KEYB'D VIOLA 8' SWITCHER
Q117
D167
DB
DC
Viola 8
UPPER KEYB'D VIOLINA 4' SWITCHER
Q118
D168
DD
Violina 4
DE
Located at Tab Panel
VR11
10K
To Chorus Mixing Preamp IC46C Pt. HW See Dwg. 12
Upper String Volume Control
330Ω
All Op Amps [Pin 4 = +10.8V / Pin 11 = -10.8V]
Located at Tab Panel
VR12
To Chorus Inverter IC46B Pt. HZ See Dwg. 12
Lower String/Vox Volume Control
DH
DJ
VOX HUMANA & LOWER SYMP STRING MIXING PREAMP
IC47D
From Vox Humana Switcher Q89 See Dwg. 4
LOWER KEYBOARD VIOLA 8' SWITCHER
Q119
D169
DF
Viola 8
LOWER KEYBOARD VIOLINA 4' SWITCHER
Q120
D170
DG
Violina 4
COLLECTOR AMP
IC35D
IC36C
IC36D
IC48D
IC47C
Switched +6V from Q105 Pt. CV (Low with Flute Preset on) See Dwg. 5
Upper String Diode Keying Groups are common to Flute Groups shown on Dwg. 3
CELLO 16' FILTERS
Cello 16' Collector Line
UPPER KEYBOARD VIOLA 8' FILTERS
Upper Keyboard Viola 8' Collector Line
UPPER KEYBOARD VIOLINA 4' FILTERS
Upper Keyboard Violina 4' Collector Line
Located on Lower Flute Symp. String Filter Board
Lower String Diode Keying Groups are common to Flute Groups shown on Dwg. 4
LOWER KEYBOARD VIOLA 8' FILTERS
Lower Keyboard Viola 8' Collector Line
LOWER KEYBOARD VIOLINA 4' FILTERS
Lower Keyboard Violina 4' Collector Line
C1 - B1 from Low Octave Keyer Q158 Pt. GD See Dwg. 9
See Note 8
See Common 8' Flute Group on Dwg. 4 for 8' Magic Chord Input
See Common 4' Flute Group on Dwg. 4 for 4' Magic Chord Input
-13V
+14V

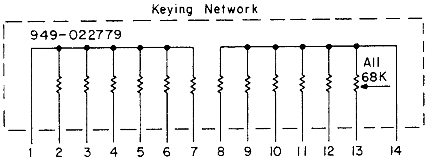
UPPER & LOWER
SYMPHONIC STRING
FILTERS

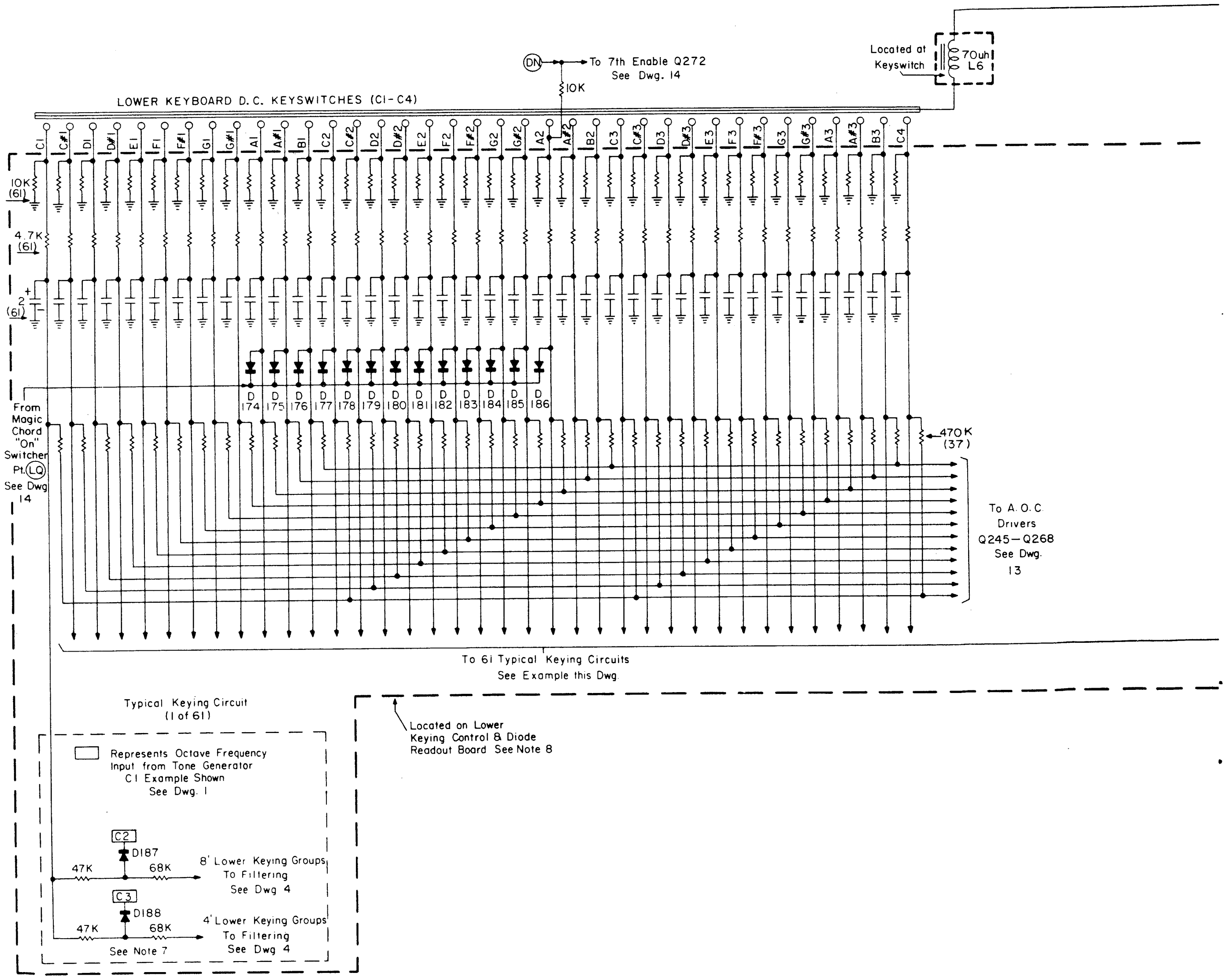
Dwg. No. 6
Model C300

NOTES

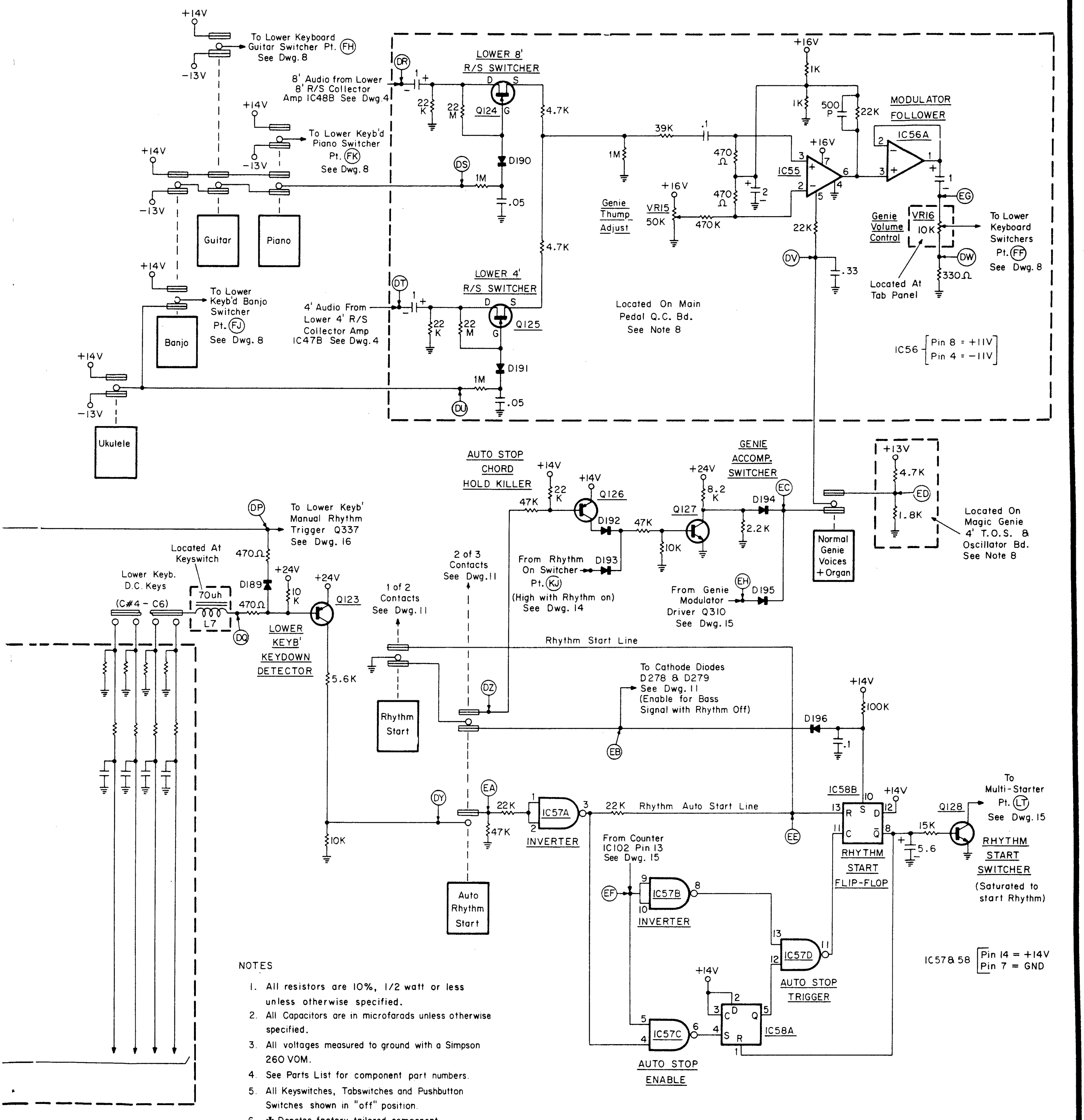
1. All resistors are 10%, 1/2 watt or less unless otherwise specified.
2. All capacitors are in microfarads unless otherwise specified.
3. All voltages measured to ground with a Simpson 260 VOM.
4. See Parts List for component part numbers.
5. All keyswitches, tabswitches and pushbutton switches shown in "off" position.
6. ✚ Denotes factory tailored component.
7. All components located on Upper Flute Symp. String Filter Board unless otherwise specified.
8. Bold lines indicate Diode Keying Groups, one note example shown on Dwg. 2 for Upper Keyboard and Dwg. 7 for Lower Keyboard.

SCHEMATIC 7


Keying Network
949-022779
All 68K
1 2 3 4 5 6 7 8 9 10 11 12 13 14


DN
To 7th Enable Q272 See Dwg. 14
10K
Located at Keyswitch
70uh L6
LOWER KEYBOARD D.C. KEYSWITCHES (C1-C4)
C1
C#1
D1
D#1
E1
F1
F#1
G1
G#1
A1
A#1
B1
C2
C#2
D2
D#2
E2
F2
F#2
G2
G#2
A2
A#2
B2
C3
C#3
D3
D#3
E3
F3
F#3
G3
G#3
A3
A#3
B3
C4
10K (61)
4.7K (61)
+ 2 (61)
D 174
D 175
D 176
D 177
D 178
D 179
D 180
D 181
D 182
D 183
D 184
D 185
D 186
From Magic Chord "On" Switcher Pt. LQ See Dwg 14
470K (37)
To A.O.C. Drivers Q245–Q268 See Dwg. 13
To 61 Typical Keying Circuits See Example this Dwg.
Located on Lower Keying Control & Diode Readout Board See Note 8
Typical Keying Circuit (1 of 61)
Represents Octave Frequency Input from Tone Generator C1 Example Shown See Dwg. 1
C2
D187
47K
68K
8' Lower Keying Groups To Filtering See Dwg 4
C3
D188
47K
68K
4' Lower Keying Groups To Filtering See Dwg 4
See Note 7

SCHEMATIC 7


+14V
To Lower Keyboard Guitar Switcher Pt. (FH) See Dwg. 8
-13V
8' Audio from Lower 8' R/S Collector Amp IC48B See Dwg. 4
(DR)
LOWER 8' R/S SWITCHER
D S
22 K
22 M
Q124 G
4.7K
+14V
To Lower Keyb'd Piano Switcher Pt. (FK) See Dwg. 8
-13V
(DS)
D190
1M
.05
Guitar
Piano
+14V
-13V
To Lower Keyb'd Banjo Switcher Pt. (FJ) See Dwg. 8
Banjo
4' Audio From Lower 4' R/S Collector Amp IC47B See Dwg. 4
(DT)
LOWER 4' R/S SWITCHER
22 K
22 M
Q125
D191
1M
(DU)
.05
+14V
-13V
Ukulele
+16V
1K
1K
500 P
22K
MODULATOR FOLLOWER
IC56A
39K
.1
1M
470 Ω
470 Ω
+16V
IC55
2
+16V
Genie Thump Adjust
VR15 50K
470K
22K
(DV)
.33
(EG)
Genie Volume Control
VR16 10K
To Lower Keyboard Switchers Pt. (FF) See Dwg. 8
(DW)
330Ω
Located At Tab Panel
Located On Main Pedal Q.C. Bd. See Note 8
IC56 Pin 8 = +11V Pin 4 = -11V
AUTO STOP CHORD HOLD KILLER
+14V
22 K
47K
+14V
Q126
D192
47K
10K
From Rhythm On Switcher Pt. (KJ) (High with Rhythm on) See Dwg. 14
D193
GENIE ACCOMP. SWITCHER
+24V
8.2 K
Q127
D194
(EC)
2.2K
From Genie Modulator Driver Q310 See Dwg. 15
(EH)
D195
Normal Genie Voices +Organ
+13V
4.7K
(ED)
1.8K
Located On Magic Genie 4' T.O.S. & Oscillator Bd. See Note 8
(DP)
To Lower Keyb' Manual Rhythm Trigger Q337 See Dwg. 16
Located At Keyswitch
470Ω
Lower Keyb. D.C. Keys (C#4 - C6)
70uh
L7
D189
470Ω
(DQ)
+24V
10 K
+24V
Q123
LOWER KEYB' KEYDOWN DETECTOR
5.6K
10K
2 of 3 Contacts See Dwg. 11
1 of 2 Contacts See Dwg. 11
Rhythm Start Line
Rhythm Start
(DZ)
To Cathode Diodes D278 & D279 See Dwg. 11 (Enable for Bass Signal with Rhythm Off)
(EB)
+14V
100K
D196
.1
(DY)
(EA)
22K
47K
IC57A
INVERTER
22K Rhythm Auto Start Line
(EE)
Auto Rhythm Start
From Counter IC102 Pin 13 See Dwg. 15
(EF)
IC57B
INVERTER
IC58B
+14V
R S D
C Q̄
RHYTHM START FLIP-FLOP
15K
5.6
Q128
To Multi-Starter Pt. (LT) See Dwg. 15
RHYTHM START SWITCHER
(Saturated to start Rhythm)
IC57D
AUTO STOP TRIGGER
+14V
C D Q
S R
IC58A
IC57C
AUTO STOP ENABLE
IC57 & 58 Pin 14 = +14V Pin 7 = GND

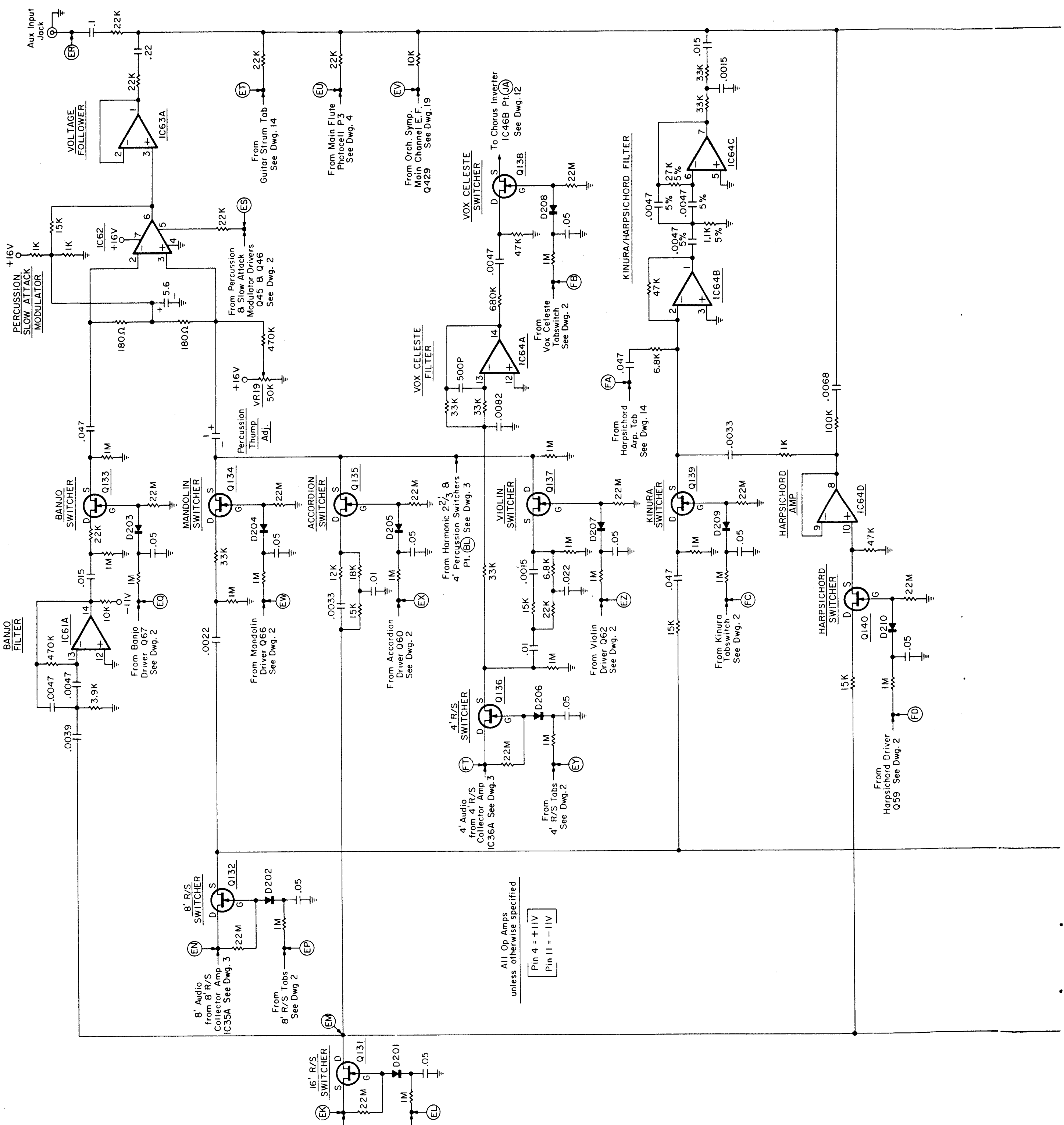
NOTES

1. All resistors are 10%, 1/2 watt or less unless otherwise specified.
2. All Capacitors are in microfarads unless otherwise specified.
3. All voltages measured to ground with a Simpson 260 VOM.
4. See Parts List for component part numbers.
5. All Keyswitches, Tabswitches and Pushbutton Switches shown in "off" position.
6. ✠ Denotes factory tailored component.
7. 68K Resistors are located in Keying Networks, See Detail this Dwg.
8. All Components located on D.C. Control Bd unless otherwise specified.

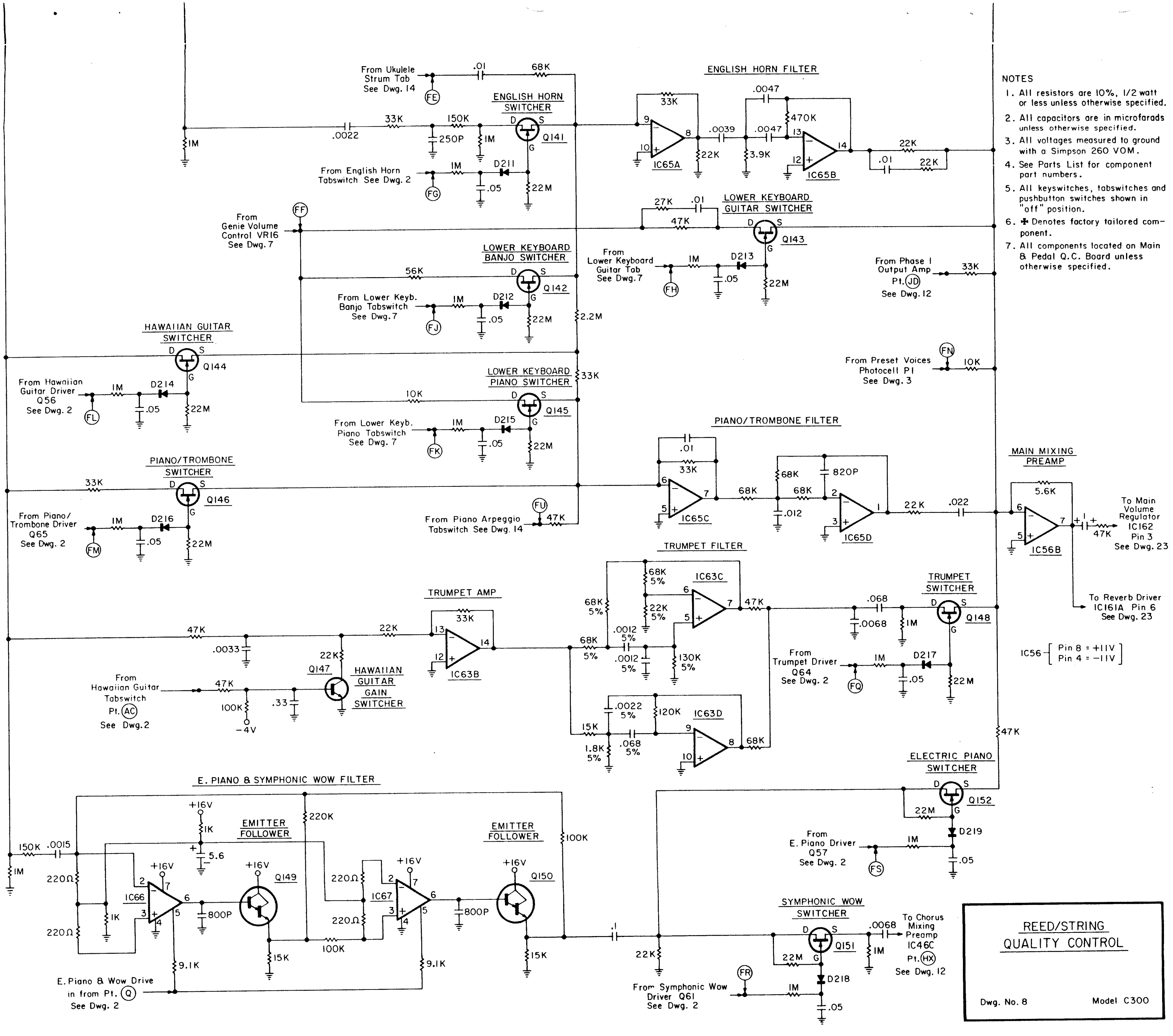
LOWER D.C. KEYSWITCHING, TABSWITCHING, GENIE MODULATOR & AUTO RHYTHM START

Dwg. No. 7 Model C300

SCHEMATIC 8


Aux Input Jack
ER
.1
22K
.22
VOLTAGE FOLLOWER
IC63A
PERCUSSION SLOW ATTACK MODULATOR
+16V
1K
15K
IC62
5.6
180Ω
470K
VR19 50K
Percussion Thump Adj.
ES
From Percussion & Slow Attack Modulator Drivers Q45 & Q46 See Dwg. 2
ET
From Guitar Strum Tab See Dwg. 14
EU
From Main Flute Photocell P3 See Dwg. 4
EV
From Orch. Symp. Main Channel E.F. Q429 See Dwg. 19
10K
VOX CELESTE SWITCHER
Q138
To Chorus Inverter IC46B Pt.(JA) See Dwg. 12
D208
FB
From Vox Celeste Tabswitch See Dwg. 2
VOX CELESTE FILTER
IC64A
680K
500P
33K
.0082
KINURA/HARPSICHORD FILTER
IC64C
IC64B
27K 5%
.0047 5%
1.1K 5%
33K
.015
.0015
6.8K
.047
FA
From Harpsichord Arp. Tab See Dwg. 14
.0068
100K
.0033
1K
HARPSICHORD AMP
IC64D
47K
BANJO SWITCHER
Q133
D203
BANJO FILTER
IC61A
3.9K
.0039
-11V
EQ
From Banjo Driver Q67 See Dwg. 2
MANDOLIN SWITCHER
Q134
D204
EW
From Mandolin Driver Q66 See Dwg. 2
.0022
ACCORDION SWITCHER
Q135
D205
EX
From Accordion Driver Q60 See Dwg. 2
12K
18K
From Harmonic 2 2/3' & 4' Percussion Switchers Pt. (BL) See Dwg. 3
VIOLIN SWITCHER
Q137
D207
EZ
From Violin Driver Q62 See Dwg. 2
KINURA SWITCHER
Q139
D209
FC
From Kinura Tabswitch See Dwg. 2
HARPSICHORD SWITCHER
Q140
D210
FD
From Harpsichord Driver Q59 See Dwg. 2
4' R/S SWITCHER
Q136
D206
FT
4' Audio from 4' R/S Collector Amp IC36A See Dwg.3
EY
From 4' R/S Tabs See Dwg.2
8' R/S SWITCHER
Q132
D202
EN
8' Audio from 8' R/S Collector Amp IC35A See Dwg. 3
EP
From 8' R/S Tabs See Dwg 2
All Op Amps unless otherwise specified
Pin 4 = +11V
Pin 11 = -11V
EM
16' R/S SWITCHER
Q131
D201
EK
16' Audio from 16' R/S Collector Amp IC35B See Dwg.3
EL
From 16' R/S Tabs See Dwg.2
22M
1M
.05
15K
22K

SCHEMATIC 8


ENGLISH HORN FILTER
IC65A
IC65B
ENGLISH HORN SWITCHER
Q141
D211
From Ukulele Strum Tab See Dwg. 14
From English Horn Tabswitch See Dwg. 2
FE
FG
FF
From Genie Volume Control VR16 See Dwg. 7
LOWER KEYBOARD GUITAR SWITCHER
Q143
D213
From Lower Keyboard Guitar Tab See Dwg. 7
FH
LOWER KEYBOARD BANJO SWITCHER
Q142
D212
From Lower Keyb. Banjo Tabswitch See Dwg. 7
FJ
LOWER KEYBOARD PIANO SWITCHER
Q145
D215
From Lower Keyb. Piano Tabswitch See Dwg. 7
FK
HAWAIIAN GUITAR SWITCHER
Q144
D214
From Hawaiian Guitar Driver Q56 See Dwg. 2
FL
PIANO/TROMBONE SWITCHER
Q146
D216
From Piano/Trombone Driver Q65 See Dwg. 2
FM
From Phase I Output Amp Pt. JD See Dwg. 12
From Preset Voices Photocell P1 See Dwg. 3
FN
From Piano Arpeggio Tabswitch See Dwg. 14
FU
PIANO/TROMBONE FILTER
IC65C
IC65D
MAIN MIXING PREAMP
IC56B
To Main Volume Regulator IC162 Pin 3 See Dwg. 23
To Reverb Driver IC161A Pin 6 See Dwg. 23
IC56 [Pin 8 = +11V, Pin 4 = −11V]
TRUMPET FILTER
IC63C
IC63D
TRUMPET AMP
IC63B
TRUMPET SWITCHER
Q148
D217
From Trumpet Driver Q64 See Dwg. 2
FQ
HAWAIIAN GUITAR GAIN SWITCHER
Q147
From Hawaiian Guitar Tabswitch Pt. AC See Dwg. 2
−4V
ELECTRIC PIANO SWITCHER
Q152
D219
From E. Piano Driver Q57 See Dwg. 2
FS
E. PIANO & SYMPHONIC WOW FILTER
IC66
IC67
EMITTER FOLLOWER
Q149
Q150
+16V
E. Piano & Wow Drive in from Pt. Q See Dwg. 2
SYMPHONIC WOW SWITCHER
Q151
D218
To Chorus Mixing Preamp IC46C Pt. HX See Dwg. 12
From Symphonic Wow Driver Q61 See Dwg. 2
FR

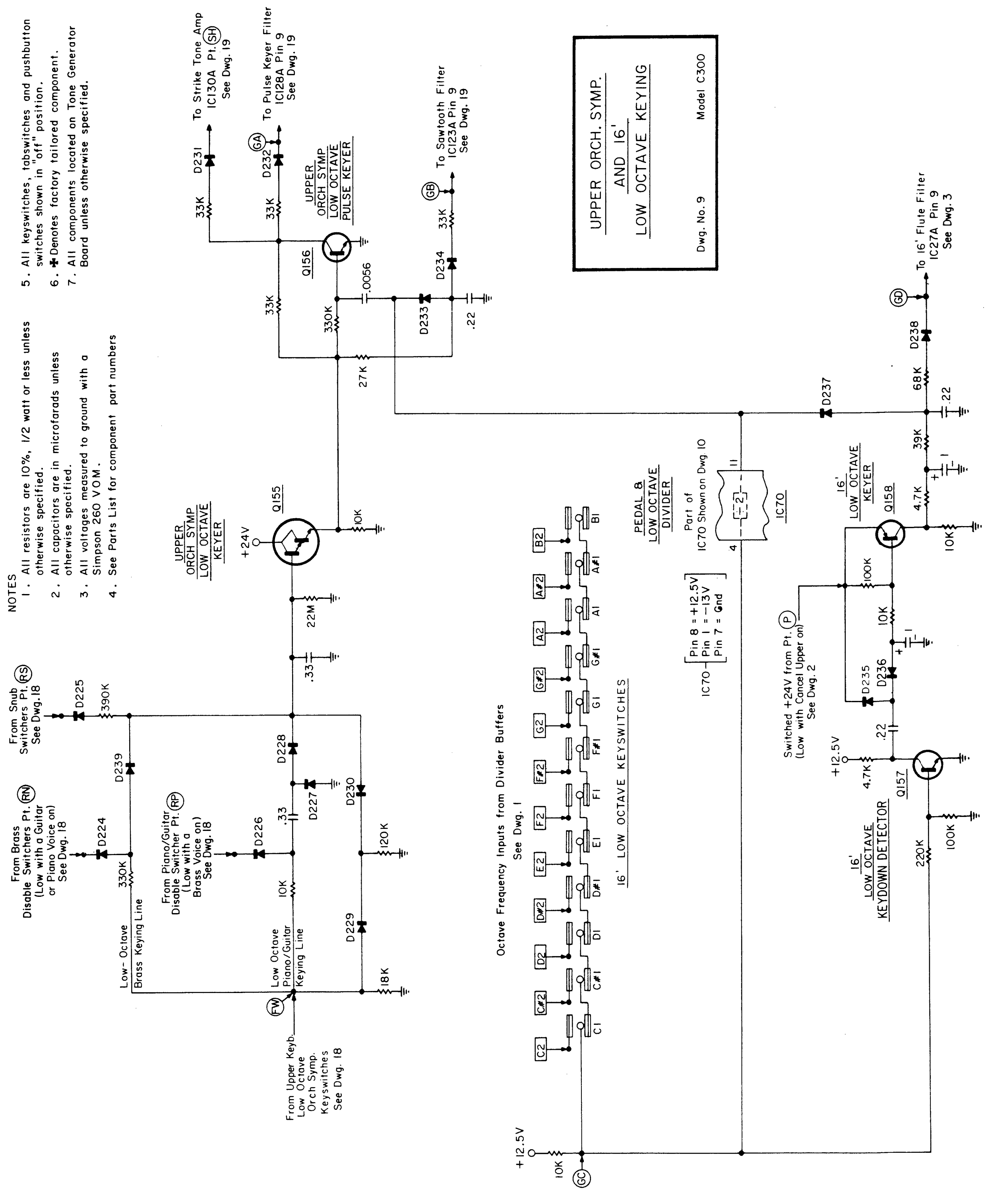
NOTES

1. All resistors are 10%, 1/2 watt or less unless otherwise specified.
2. All capacitors are in microfarads unless otherwise specified.
3. All voltages measured to ground with a Simpson 260 VOM.
4. See Parts List for component part numbers.
5. All keyswitches, tabswitches and pushbutton switches shown in "off" position.
6. ✚ Denotes factory tailored component.
7. All components located on Main & Pedal Q.C. Board unless otherwise specified.

REED/STRING
QUALITY CONTROL

Dwg. No. 8
Model C300

SCHEMATIC 9

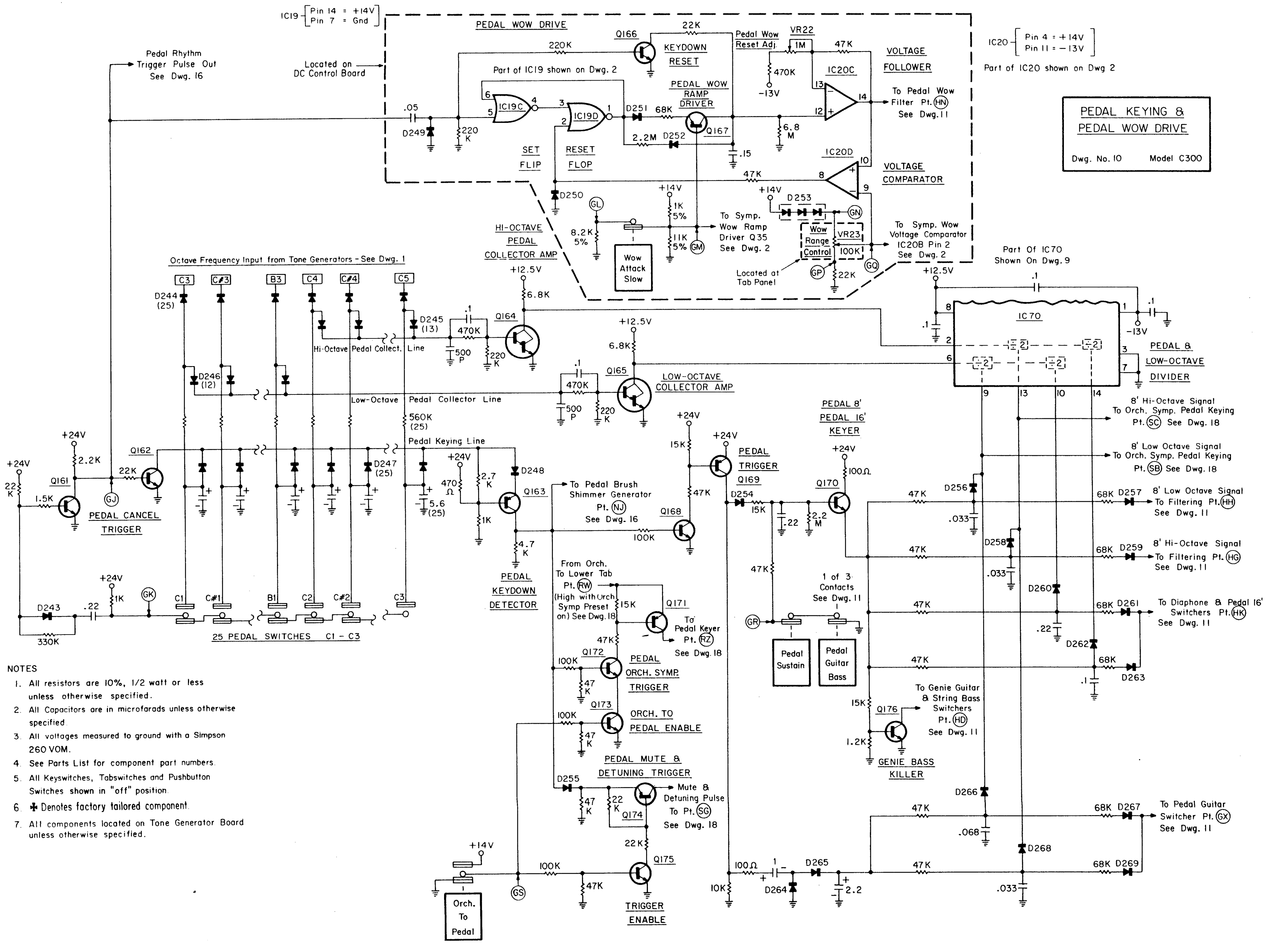

To Strike Tone Amp IC130A Pt. (SH) See Dwg. 19
To Pulse Keyer Filter IC128A Pin 9 See Dwg. 19
To Sawtooth Filter IC123A Pin 9 See Dwg. 19
To 16' Flute Filter IC27A Pin 9 See Dwg. 3
D231
D232
(GA)
(GB)
(GD)
33K
33K
33K
33K
Q156
UPPER ORCH SYMP LOW OCTAVE PULSE KEYER
.0056
D234
D233
.22
330K
27K
D237
D238
68K
.22
39K
1
4.7K
Q158
16' LOW OCTAVE KEYER
10K
100K
10K
1
D235
D236
.22
Switched +24V from Pt. (P) (Low with Cancel Upper on) See Dwg. 2
+12.5V
4.7K
Q157
16' LOW OCTAVE KEYDOWN DETECTOR
220K
100K
PEDAL & LOW OCTAVE DIVIDER
Part of IC70 Shown on Dwg 10
IC70
11
4
2
IC70 Pin 8 = +12.5V Pin 1 = −13V Pin 7 = Gnd
UPPER ORCH SYMP LOW OCTAVE KEYER
Q155
+24V
10K
22M
.33
From Snub Switchers Pt. (RS) See Dwg. 18
D225
390K
D239
From Brass Disable Switchers Pt. (RN) (Low with a Guitar or Piano Voice on) See Dwg. 18
D224
330K
Low-Octave Brass Keying Line
From Piano/Guitar Disable Switcher Pt. (RP) (Low with a Brass Voice on) See Dwg. 18
D226
D228
D227
.33
D230
120K
10K
D229
18K
Low Octave Piano/Guitar Keying Line
(FW)
From Upper Keyb. Low Octave Orch Symp. Keyswitches See Dwg. 18
Octave Frequency Inputs from Divider Buffers See Dwg. 1
B2
A#2
A2
G#2
G2
F#2
F2
E2
D#2
D2
C#2
C2
B1
A#1
A1
G#1
G1
F#1
F1
E1
D#1
D1
C#1
C1
16' LOW OCTAVE KEYSWITCHES
+12.5V
10K
(GC)

NOTES
1. All resistors are 10%, 1/2 watt or less unless otherwise specified.
2. All capacitors are in microfarads unless otherwise specified.
3. All voltages measured to ground with a Simpson 260 VOM.
4. See Parts List for component part numbers
5. All keyswitches, tabswitches and pushbutton switches shown in "off" position.
6. ✤ Denotes factory tailored component.
7. All components located on Tone Generator Board unless otherwise specified.

UPPER ORCH. SYMP.
AND 16'
LOW OCTAVE KEYING

Dwg. No. 9 Model C300

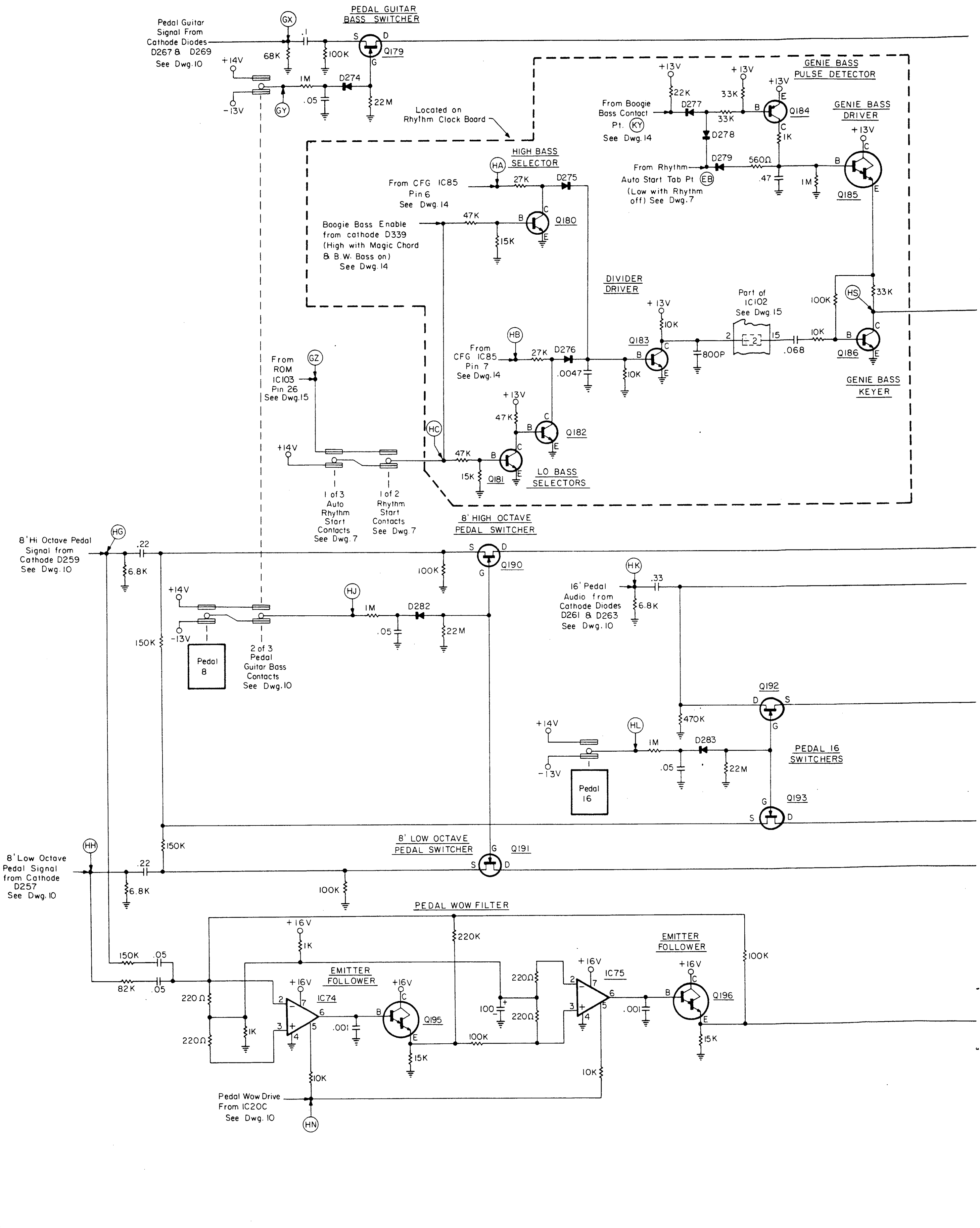
SCHEMATIC 10


PEDAL KEYING &
PEDAL WOW DRIVE
Dwg. No. 10
Model C300
IC19 [Pin 14 = +14V, Pin 7 = Gnd]
Located on DC Control Board
IC20 [Pin 4 = +14V, Pin 11 = −13V]
Part of IC20 shown on Dwg 2
Pedal Rhythm Trigger Pulse Out See Dwg. 16
PEDAL WOW DRIVE
Part of IC19 shown on Dwg. 2
KEYDOWN RESET
Q166
220K
22K
Pedal Wow Reset Adj.
VR22
1M
470K
−13V
47K
IC20C
VOLTAGE FOLLOWER
To Pedal Wow Filter Pt. HN See Dwg.11
PEDAL WOW RAMP DRIVER
Q167
IC19C
IC19D
.05
D249
220 K
D251
68K
2.2M
D252
6.8 M
.15
SET FLIP
RESET FLOP
IC20D
VOLTAGE COMPARATOR
47K
+14V
D253
D250
GL
8.2K 5%
1K 5%
11K 5%
GM
GN
Wow Attack Slow
To Symp. Wow Ramp Driver Q35 See Dwg. 2
Wow Range Control
VR23
100K
Located at Tab Panel
GP
22K
To Symp. Wow Voltage Comparator IC20B Pin 2 See Dwg. 2
GQ
Part Of IC70 Shown On Dwg. 9
+12.5V
IC70
−13V
PEDAL & LOW-OCTAVE DIVIDER
HI-OCTAVE PEDAL COLLECTOR AMP
Q164
6.8K
470K
500 P
220 K
Octave Frequency Input from Tone Generators - See Dwg. 1
C3
C#3
B3
C4
C#4
C5
D244 (25)
D245 (13)
D246 (12)
Hi-Octave Pedal Collect. Line
Low-Octave Pedal Collector Line
LOW-OCTAVE COLLECTOR AMP
Q165
560K (25)
Pedal Keying Line
D247 (25)
5.6 (25)
+24V
2.2K
Q161
Q162
22K
GJ
1.5K
PEDAL CANCEL TRIGGER
470 Ω
2.7 K
1K
D248
Q163
4.7 K
PEDAL KEYDOWN DETECTOR
To Pedal Brush Shimmer Generator Pt. NJ See Dwg. 16
Q168
100K
15K
47K
PEDAL TRIGGER
Q169
D254
D243
330K
.22
GK
C1
C#1
B1
C2
C#2
C3
25 PEDAL SWITCHES C1 - C3
From Orch. To Lower Tab Pt. RW (High with Orch Symp Preset on) See Dwg. 18
Q171
To Pedal Keyer Pt. RZ See Dwg. 18
Q172
PEDAL ORCH. SYMP. TRIGGER
Q173
ORCH. TO PEDAL ENABLE
PEDAL MUTE & DETUNING TRIGGER
Mute & Detuning Pulse To Pt. SG See Dwg. 18
D255
Q174
Q175
TRIGGER ENABLE
GS
+14V
Orch. To Pedal
PEDAL 8' PEDAL 16' KEYER
Q170
100Ω
2.2 M
.22
GR
1 of 3 Contacts See Dwg. 11
Pedal Sustain
Pedal Guitar Bass
To Genie Guitar & String Bass Switchers Pt. HD See Dwg. 11
Q176
1.2K
GENIE BASS KILLER
8' Hi-Octave Signal To Orch. Symp. Pedal Keying Pt. SC See Dwg. 18
8' Low Octave Signal To Orch. Symp. Pedal Keying Pt. SB See Dwg. 18
8' Low Octave Signal To Filtering Pt. HH See Dwg. 11
8' Hi-Octave Signal To Filtering Pt. HG See Dwg. 11
To Diaphone & Pedal 16' Switchers Pt. HK See Dwg. 11
To Pedal Guitar Switcher Pt. GX See Dwg. 11
D256
D257
D258
D259
D260
D261
D262
D263
D264
D265
D266
D267
D268
D269
68K
.033
.068
2.2
10K

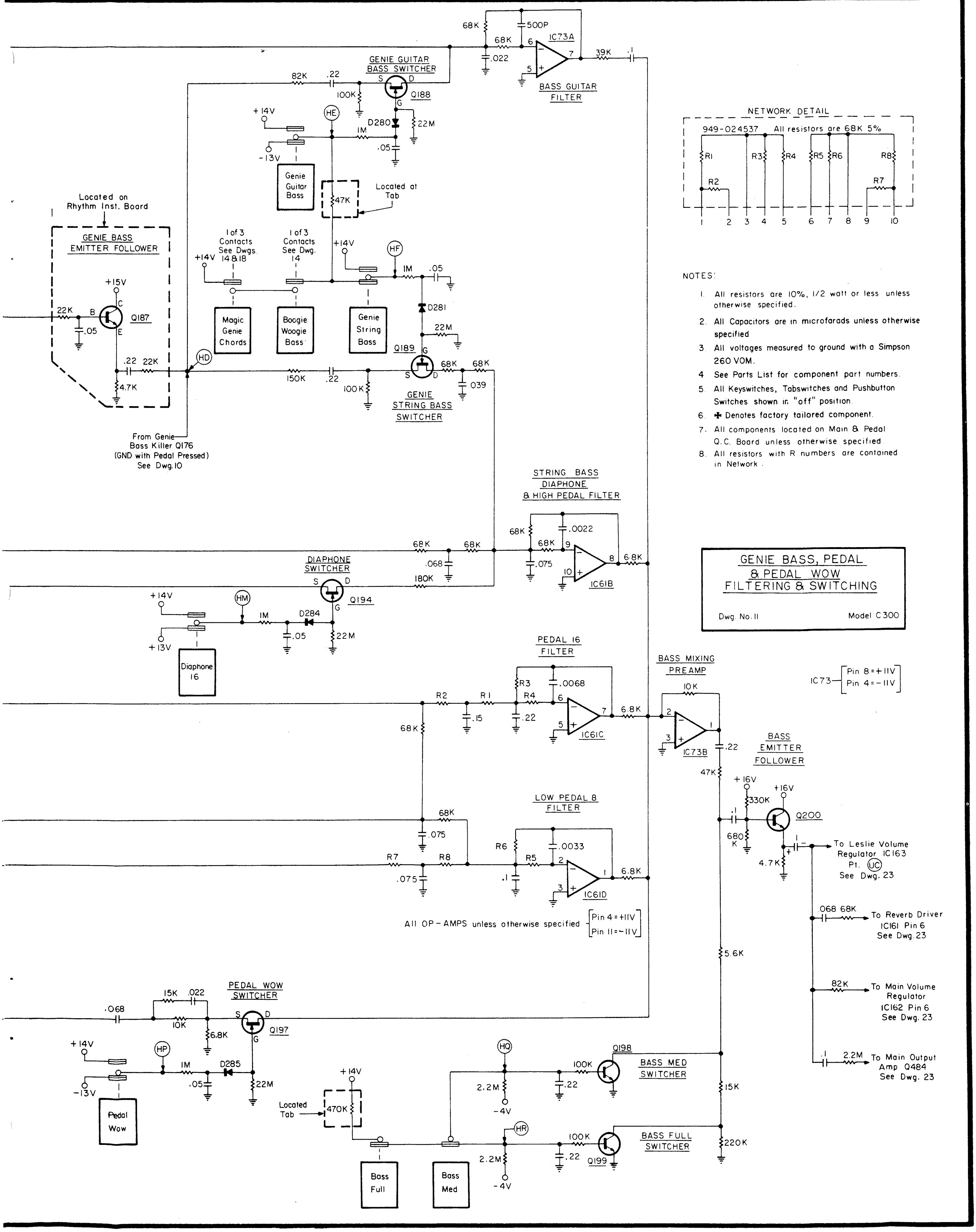
NOTES

1. All resistors are 10%, 1/2 watt or less unless otherwise specified.
2. All Capacitors are in microfarads unless otherwise specified.
3. All voltages measured to ground with a Simpson 260 VOM.
4. See Parts List for component part numbers.
5. All Keyswitches, Tabswitches and Pushbutton Switches shown in "off" position.
6. ✚ Denotes factory tailored component.
7. All components located on Tone Generator Board unless otherwise specified.

SCHEMATIC 11


PEDAL GUITAR BASS SWITCHER
Pedal Guitar Signal From Cathode Diodes D267 & D269 See Dwg. 10
GX
.1
68K
100K
S
D
G
Q179
+14V
-13V
1M
D274
.05
22M
GY
Located on Rhythm Clock Board
GENIE BASS PULSE DETECTOR
+13V
22K
33K
From Boogie Bass Contact Pt. KY See Dwg. 14
D277
33K
B
E
C
Q184
1K
D278
GENIE BASS DRIVER
From Rhythm Auto Start Tab Pt EB (Low with Rhythm off) See Dwg. 7
D279
560Ω
.47
1M
Q185
HIGH BASS SELECTOR
HA
From CFG IC85 Pin 6 See Dwg. 14
27K
D275
Boogie Bass Enable from cathode D339 (High with Magic Chord & B.W. Bass on) See Dwg. 14
47K
15K
Q180
DIVIDER DRIVER
Part of IC102 See Dwg. 15
100K
HS
33K
10K
2
÷2
15
.068
Q183
800P
Q186
GENIE BASS KEYER
HB
From CFG IC85 Pin 7 See Dwg. 14
27K
D276
.0047
10K
From ROM IC103 Pin 26 See Dwg. 15
GZ
47K
Q182
HC
+14V
47K
15K
Q181
LO BASS SELECTORS
1 of 3 Auto Rhythm Start Contacts See Dwg. 7
1 of 2 Rhythm Start Contacts See Dwg. 7
8' HIGH OCTAVE PEDAL SWITCHER
8' Hi Octave Pedal Signal from Cathode D259 See Dwg. 10
HG
.22
6.8K
100K
Q190
HK
.33
16' Pedal Audio from Cathode Diodes D261 & D263 See Dwg. 10
6.8K
HJ
1M
D282
.05
22M
150K
Pedal 8
2 of 3 Pedal Guitar Bass Contacts See Dwg. 10
Q192
470K
HL
1M
D283
.05
22M
PEDAL 16 SWITCHERS
Pedal 16
Q193
150K
8' LOW OCTAVE PEDAL SWITCHER
Q191
HH
8' Low Octave Pedal Signal from Cathode D257 See Dwg. 10
.22
6.8K
100K
PEDAL WOW FILTER
+16V
1K
220K
EMITTER FOLLOWER
150K
.05
82K
.05
220Ω
220Ω
1K
IC74
.001
Q195
100K
15K
10K
220Ω
100
220Ω
IC75
.001
Q196
100K
15K
10K
Pedal Wow Drive From IC20C See Dwg. 10
HN

SCHEMATIC 11


GENIE GUITAR BASS SWITCHER
Q188
IC73A
BASS GUITAR FILTER
500P
68K
.022
39K
82K
.22
100K
D280
22M
1M
.05
+14V
-13V
HE
Genie Guitar Bass
47K
Located at Tab
Located on Rhythm Inst. Board
GENIE BASS EMITTER FOLLOWER
+15V
Q187
22K
4.7K
1 of 3 Contacts See Dwgs. 14 & 18
1 of 3 Contacts See Dwg. 14
HF
Magic Genie Chords
Boogie Woogie Bass
Genie String Bass
D281
Q189
HD
150K
GENIE STRING BASS SWITCHER
039
From Genie Bass Killer Q176 (GND with Pedal Pressed) See Dwg. 10
NETWORK DETAIL
949-024537
All resistors are 68K 5%
R1
R2
R3
R4
R5
R6
R7
R8
1 2 3 4 5 6 7 8 9 10
STRING BASS DIAPHONE & HIGH PEDAL FILTER
.0022
.068
.075
IC61B
6.8K
DIAPHONE SWITCHER
Q194
180K
HM
D284
+13V
Diaphone 16
PEDAL 16 FILTER
.0068
.15
IC61C
BASS MIXING PREAMP
10K
IC73B
IC73 [Pin 8 = +11V, Pin 4 = -11V]
BASS EMITTER FOLLOWER
+16V
330K
Q200
680K
To Leslie Volume Regulator IC163 Pt. UC See Dwg. 23
LOW PEDAL 8 FILTER
.0033
IC61D
All OP-AMPS unless otherwise specified [Pin 4 = +11V, Pin 11 = -11V]
To Reverb Driver IC161 Pin 6 See Dwg. 23
5.6K
To Main Volume Regulator IC162 Pin 6 See Dwg. 23
To Main Output Amp Q484 See Dwg. 23
2.2M
PEDAL WOW SWITCHER
15K
10K
Q197
HP
D285
Pedal Wow
HQ
Q198
BASS MED SWITCHER
-4V
470K
Located Tab
HR
BASS FULL SWITCHER
Q199
15K
220K
Bass Full
Bass Med

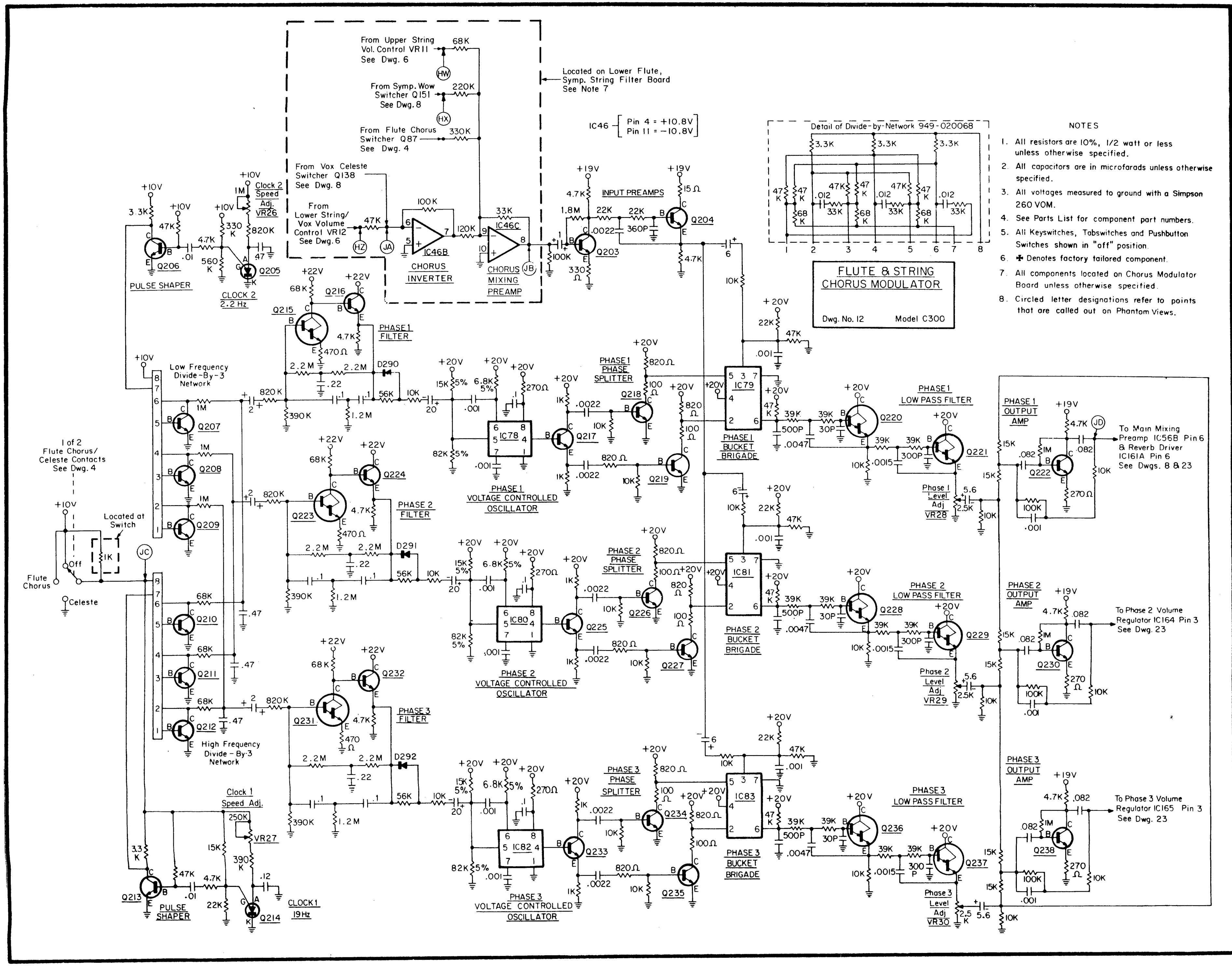
NOTES:

1. All resistors are 10%, 1/2 watt or less unless otherwise specified.
2. All Capacitors are in microfarads unless otherwise specified.
3. All voltages measured to ground with a Simpson 260 VOM.
4. See Parts List for component part numbers.
5. All Keyswitches, Tabswitches and Pushbutton Switches shown in "off" position.
6. ✚ Denotes factory tailored component.
7. All components located on Main & Pedal Q.C. Board unless otherwise specified.
8. All resistors with R numbers are contained in Network.

GENIE BASS, PEDAL
& PEDAL WOW
FILTERING & SWITCHING

Dwg. No. 11
Model C300

SCHEMATIC 12


From Upper String Vol. Control VR11 See Dwg. 6
68K
HW
From Symp. Wow Switcher Q151 See Dwg. 8
220K
HX
From Flute Chorus Switcher Q87 See Dwg. 4
330K
From Vox Celeste Switcher Q138 See Dwg. 8
From Lower String/ Vox Volume Control VR12 See Dwg. 6
47K
HZ
JA
100K
IC46B
CHORUS INVERTER
120K
33K
IC46C
CHORUS MIXING PREAMP
JB
Located on Lower Flute, Symp. String Filter Board See Note 7
IC46 Pin 4 = +10.8V Pin 11 = −10.8V
INPUT PREAMPS
+19V
4.7K
1.8M
22K
.0022
360P
15Ω
Q203
Q204
100K
330 Ω
4.7K
6
10K
+10V
3.3K
47K
.01
4.7K
330 K
560 K
1M
Clock 2 Speed Adj. VR26
820K
47
Q206
Q205
PULSE SHAPER
CLOCK 2 2.2 Hz
Low Frequency Divide-By-3 Network
Q207
Q208
Q209
1 of 2 Flute Chorus/ Celeste Contacts See Dwg. 4
Located at Switch
1K
Off
Flute Chorus
Celeste
JC
Q210
Q211
Q212
68K
.47
High Frequency Divide-By-3 Network
Clock 1 Speed Adj.
250K
VR27
15K
390 K
.12
47K
22K
Q213
Q214
PULSE SHAPER
CLOCK1 19Hz
+22V
Q215
Q216
470Ω
PHASE 1 FILTER
2.2 M
.22
D290
820K
390K
1.2M
56K
Q223
Q224
PHASE 2 FILTER
D291
Q231
Q232
PHASE 3 FILTER
D292
+20V
15K 5%
6.8K 5%
270Ω
IC78
82K 5%
.001
20
PHASE 1 VOLTAGE CONTROLLED OSCILLATOR
IC80
PHASE 2 VOLTAGE CONTROLLED OSCILLATOR
IC82
PHASE 3 VOLTAGE CONTROLLED OSCILLATOR
1K
Q217
Q218
Q219
PHASE 1 PHASE SPLITTER
820Ω
100 Ω
10K
Q225
Q226
Q227
PHASE 2 PHASE SPLITTER
Q233
Q234
Q235
PHASE 3 PHASE SPLITTER
IC79
PHASE 1 BUCKET BRIGADE
IC81
PHASE 2 BUCKET BRIGADE
IC83
PHASE 3 BUCKET BRIGADE
39K
500P
30P
.0047
300P
.0015
Q220
Q221
PHASE 1 LOW PASS FILTER
Q228
Q229
PHASE 2 LOW PASS FILTER
Q236
Q237
PHASE 3 LOW PASS FILTER
Phase 1 Level Adj VR28
5.6
2.5K
Phase 2 Level Adj VR29
Phase 3 Level Adj VR30
PHASE 1 OUTPUT AMP
PHASE 2 OUTPUT AMP
PHASE 3 OUTPUT AMP
+19V
.082
1M
Q222
Q230
Q238
270Ω
100K
JD
To Main Mixing Preamp IC56B Pin 6 & Reverb Driver IC161A Pin 6 See Dwgs. 8 & 23
To Phase 2 Volume Regulator IC164 Pin 3 See Dwg. 23
To Phase 3 Volume Regulator IC165 Pin 3 See Dwg. 23
Detail of Divide-by-Network 949-020068
3.3K
.012
33K
47 K
68 K
1
2
3
4
5
6
7
8

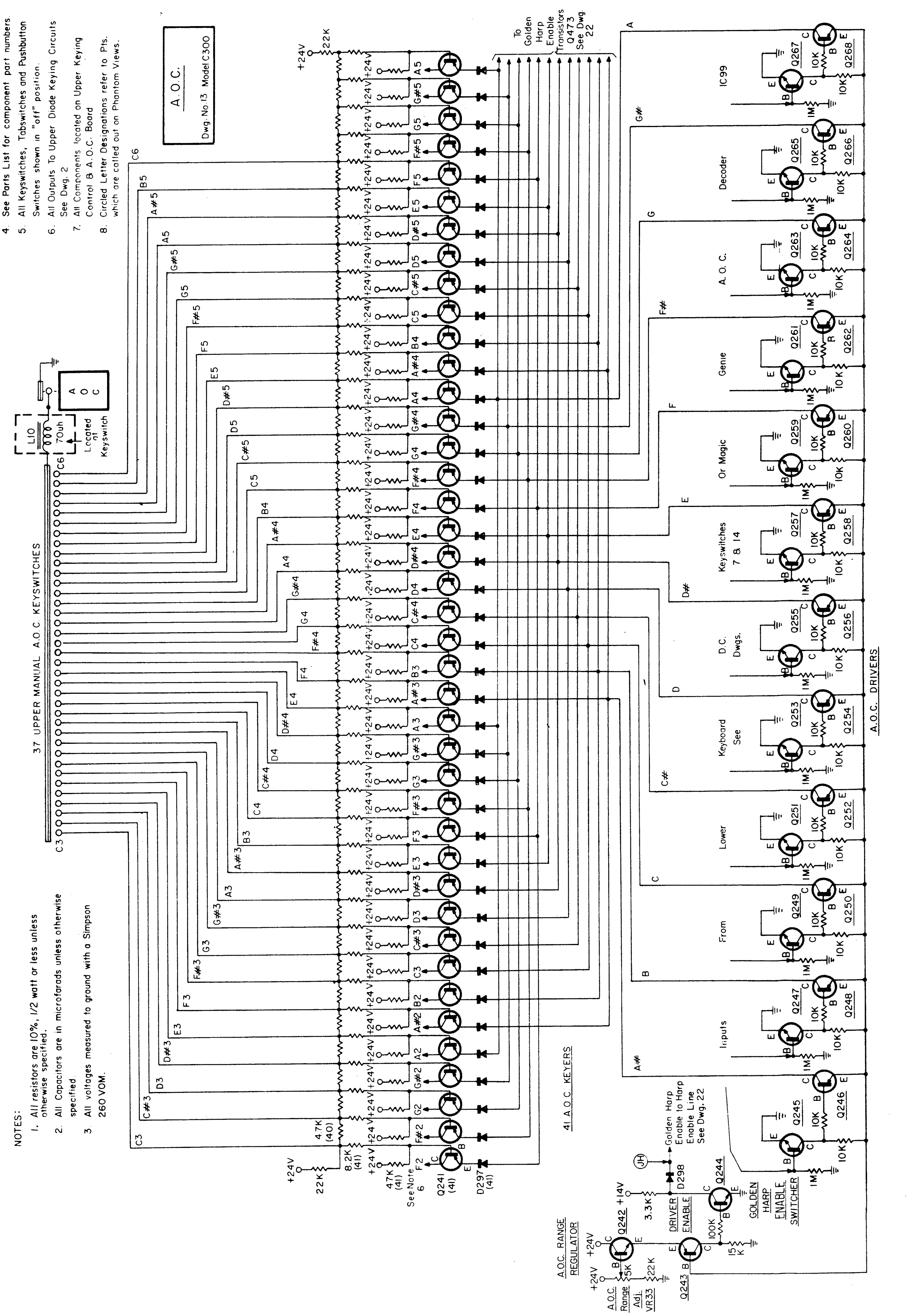
FLUTE & STRING CHORUS MODULATOR

Dwg. No. 12 Model C300

NOTES

1. All resistors are 10%, 1/2 watt or less unless otherwise specified.
2. All capacitors are in microfarads unless otherwise specified.
3. All voltages measured to ground with a Simpson 260 VOM.
4. See Parts List for component part numbers.
5. All Keyswitches, Tabswitches and Pushbutton Switches shown in "off" position.
6. ✚ Denotes factory tailored component.
7. All components located on Chorus Modulator Board unless otherwise specified.
8. Circled letter designations refer to points that are called out on Phantom Views.

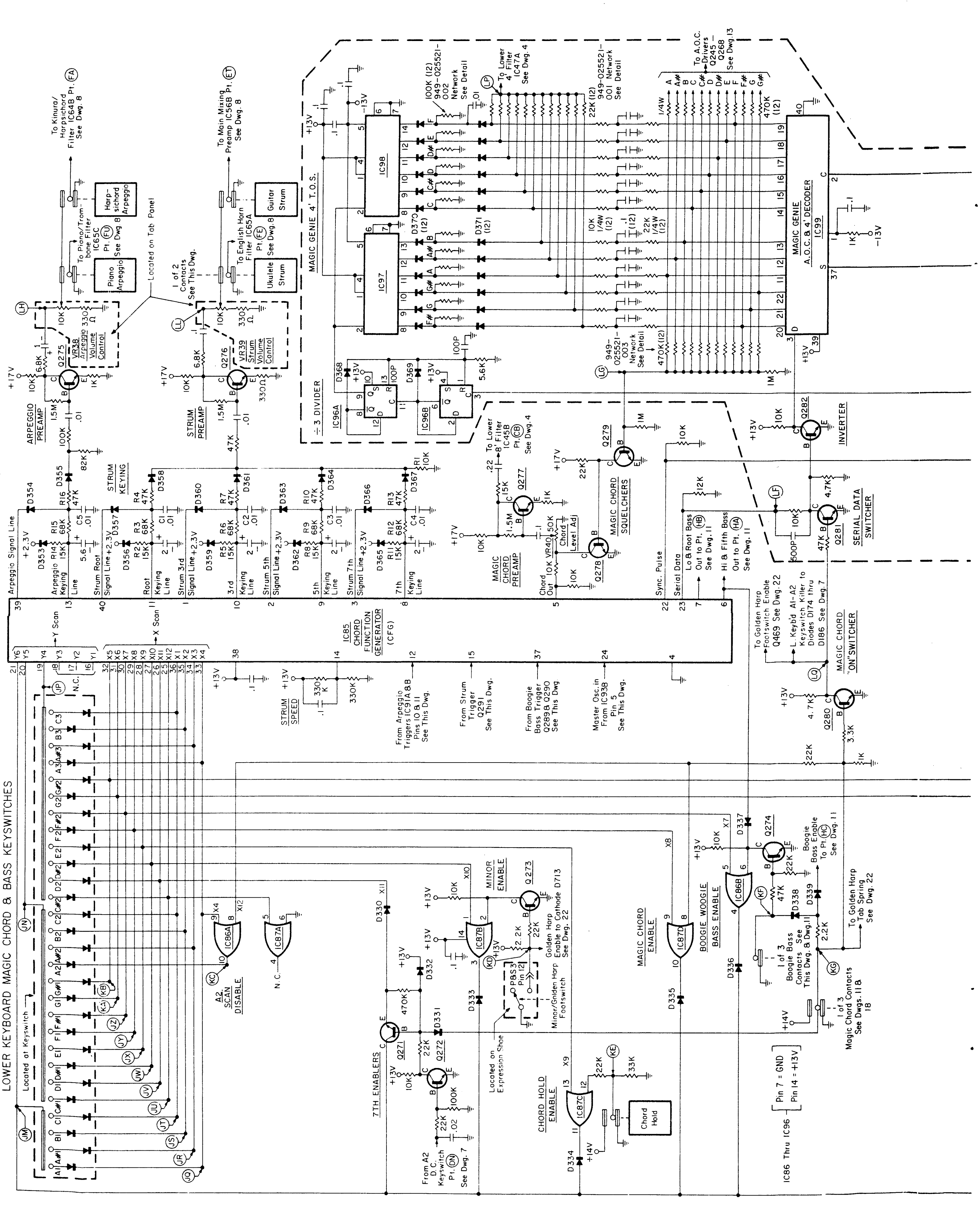
SCHEMATIC 13


A.O.C.
Dwg. No. 13 Model C300
37 UPPER MANUAL A.O.C. KEYSWITCHES
41 A.O.C. KEYERS
A.O.C. DRIVERS
L10
70uh
Located at Keyswitch
A O C
+24V
22K
47K (40)
8.2K (41)
47K (41)
See Note 6
Q241 (41)
D297 (41)
To Golden Harp Enable Transistors Q473 See Dwg. 22
IC99 Decoder A.O.C. Genie Or Magic Keyswitches 7 & 14 D.C. Dwgs. Keyboard See Lower From Inputs
Q245 Q246 Q247 Q248 Q249 Q250 Q251 Q252 Q253 Q254 Q255 Q256 Q257 Q258 Q259 Q260 Q261 Q262 Q263 Q264 Q265 Q266 Q267 Q268
10K
1M
A.O.C. RANGE REGULATOR
Q242
+14V
5K
A.O.C. Range Adj. VR33
Q243
DRIVER ENABLE
3.3K
100K
15K
D298
Q244
Golden Harp Enable to Harp Enable Line See Dwg. 22
GOLDEN HARP ENABLE SWITCHER
JH

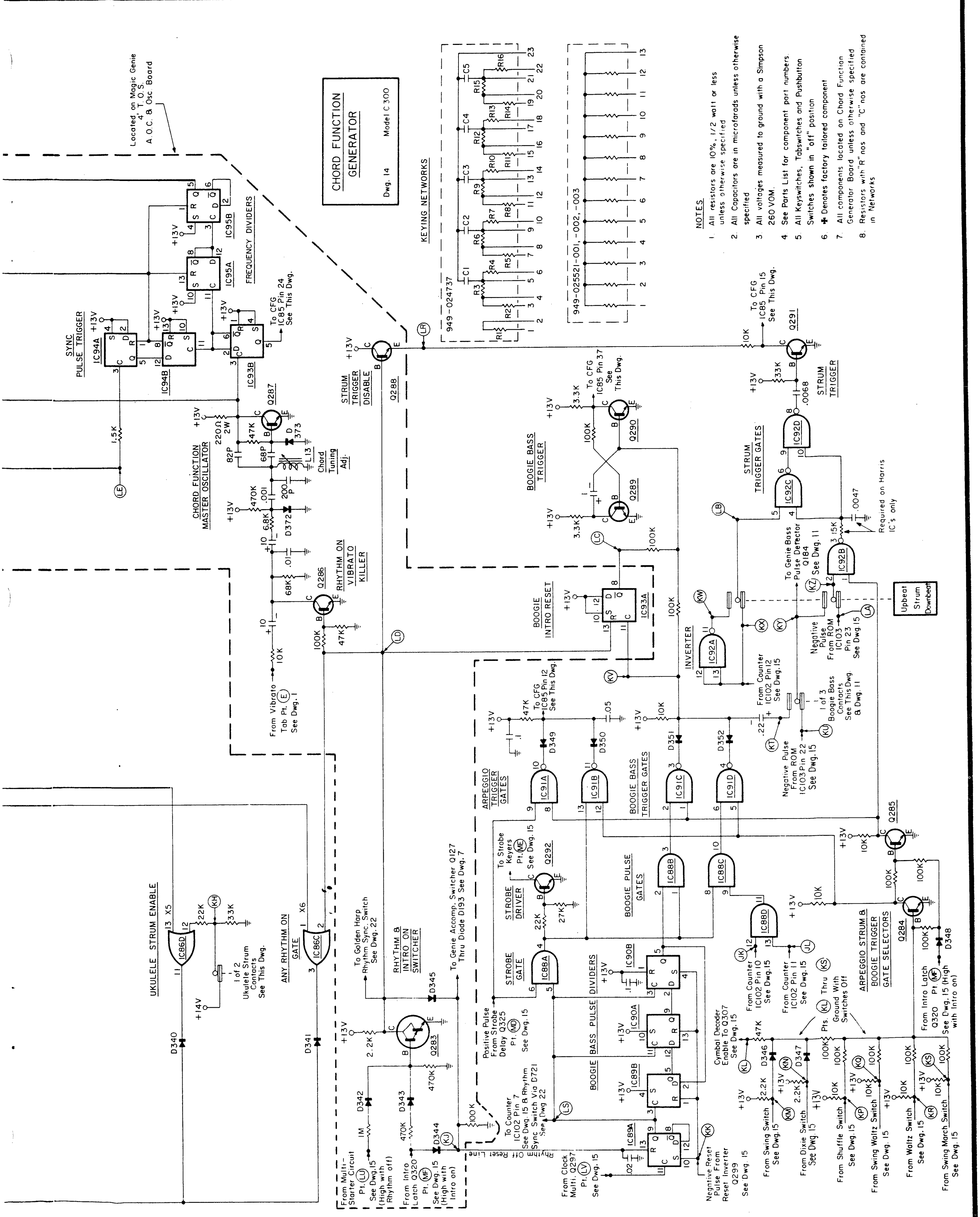
NOTES:

1. All resistors are 10%, 1/2 watt or less unless otherwise specified.
2. All Capacitors are in microfarads unless otherwise specified
3. All voltages measured to ground with a Simpson 260 VOM.
4. See Parts List for component part numbers
5. All Keyswitches, Tabswitches and Pushbutton Switches shown in "off" position.
6. All Outputs To Upper Diode Keying Circuits See Dwg. 2
7. All Components located on Upper Keying Control & A.O.C. Board
8. Circled Letter Designations refer to Pts. which are called out on Phantom Views.

SCHEMATIC 14


LOWER KEYBOARD MAGIC CHORD & BASS KEYSWITCHES
Located at Keyswitch
To Kinura/Harpsichord Filter IC64B Pt. (FA) See Dwg. 8
To Piano/Trombone Filter IC65C Pt. (FU) See Dwg. 8
Harpsichord Arpeggio
Piano Arpeggio
Located on Tab Panel
1 of 2 Contacts See This Dwg.
To Main Mixing Preamp IC56B Pt. (ET) See Dwg. 8
To English Horn Filter IC65A Pt. (FE) See Dwg. 8
Guitar Strum
Ukulele Strum
VR38 Arpeggio Volume Control
VR39 Strum Volume Control
Q275
Q276
ARPEGGIO PREAMP
STRUM PREAMP
STRUM KEYING
Arpeggio Signal Line
Arpeggio Keying Line
Strum Root Signal Line
Root Keying Line
Strum 3rd Signal Line
3rd Keying Line
Strum 5th Signal Line
5th Keying Line
Strum 7th Signal Line
7th Keying Line
IC85 CHORD FUNCTION GENERATOR (CFG)
Y Scan
X Scan
STRUM SPEED
From Arpeggio Triggers IC91A & B Pins 10 & 11 See This Dwg.
From Strum Trigger Q291 See This Dwg.
From Boogie Bass Trigger Q289 & Q290 See This Dwg
Master Osc. in From IC93B Pin 5 See This Dwg.
MAGIC GENIE 4' T.O.S.
IC97
IC98
÷3 DIVIDER
IC96A
IC96B
100K (12) 949-025521-002 Network See Detail
To Lower 4' Filter IC47A See Dwg. 4
22K (12) 949-025521-001 Network See Detail
949-025521-003 Network See Detail
To A.O.C. Drivers Q245–Q268 See Dwg.13
MAGIC GENIE A.O.C. & 4' DECODER IC99
To Lower 8' Filter IC45B Pt. (CB) See Dwg.4
MAGIC CHORD PREAMP
Q277
VR40 Chord Level Adj
Chord Out
Q278
Q279
MAGIC CHORD SQUELCHERS
Sync. Pulse
Serial Data
Lo B Root Bass Out to Pt. (HB) See Dwg. 11
Hi B Fifth Bass Out to Pt. (HA) See Dwg. 11
Q282 INVERTER
Q281 SERIAL DATA SWITCHER
To Golden Harp Footswitch Enable Q469 See Dwg. 22
L. Keybd A1–A2 Keyswitch Killer to Diodes D174 thru D186 See Dwg.7
Q280 MAGIC CHORD "ON" SWITCHER
IC86A A2 SCAN DISABLE
IC87A
N.C.
IC87B MINOR ENABLE
Q273
Golden Harp Enable to Cathode D713 See Dwg. 22
Minor/Golden Harp Footswitch
Located on Expression Shoe
7TH ENABLERS
Q271
Q272
From A2 D.C. Keyswitch Pt. (DN) See Dwg. 7
IC87C CHORD HOLD ENABLE
Chord Hold
IC87D MAGIC CHORD ENABLE
IC86B BOOGIE WOOGIE BASS ENABLE
Q274
Boogie Bass Enable To Pt. (HC) See Dwg. 11
1 of 3 Boogie Bass Contacts See This Dwg. & Dwg.11
1 of 3 Magic Chord Contacts See Dwgs. 11 & 18
To Golden Harp Tab Spring See Dwg. 22
IC86 Thru IC96 [Pin 7 = GND, Pin 14 = +13V]

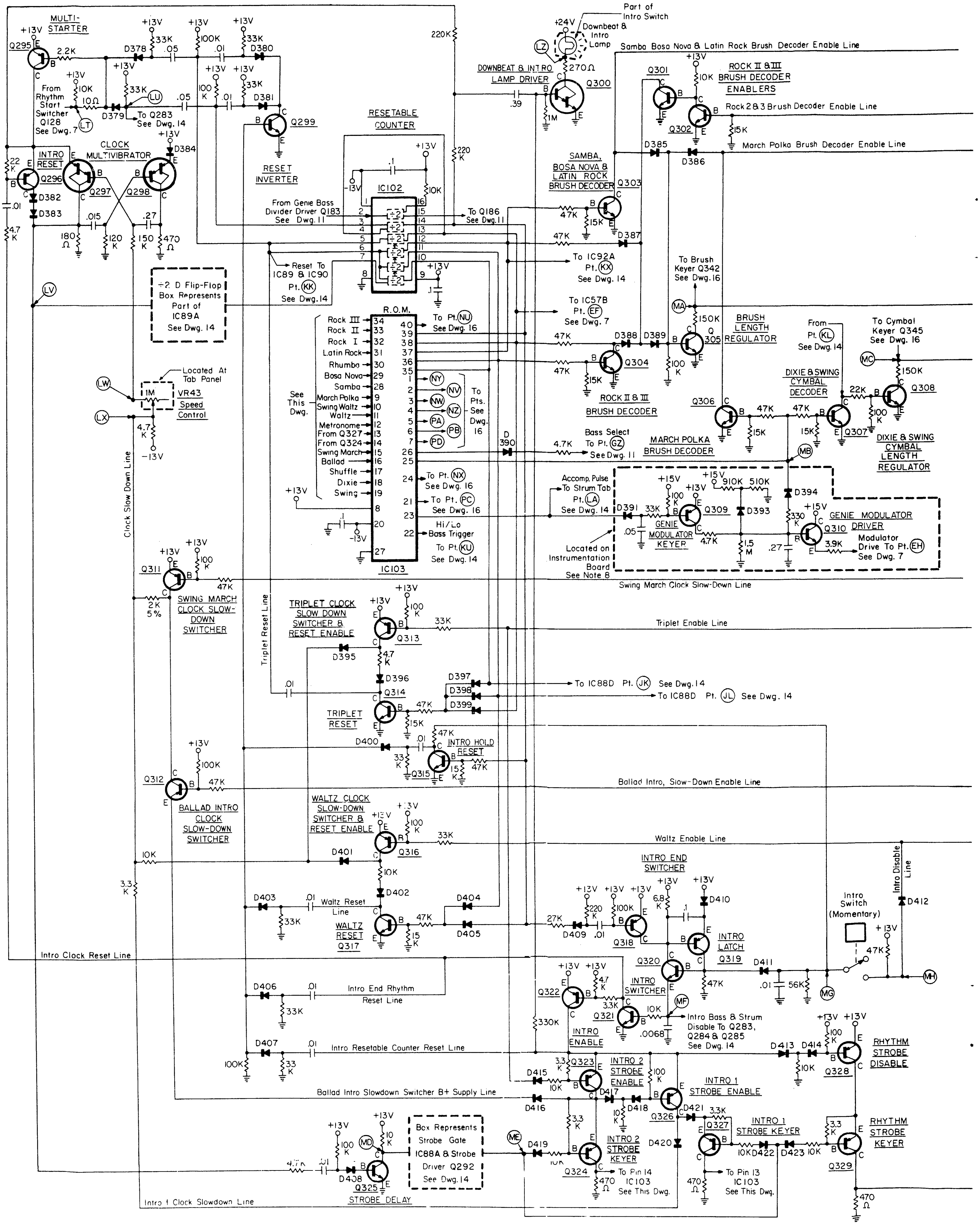
SCHEMATIC 14


CHORD FUNCTION GENERATOR
Dwg. 14 Model C300
KEYING NETWORKS
949-024737
949-025521-001, -002, -003
Located on Magic Genie 4' T.O.S. A.O.C. & Osc Board
SYNC PULSE TRIGGER
IC94A
IC94B
IC95A
IC95B
IC93B
FREQUENCY DIVIDERS
To CFG IC85 Pin 24 See This Dwg.
CHORD FUNCTION MASTER OSCILLATOR
Q287
D373
D372
L13
Chord Tuning Adj.
RHYTHM ON VIBRATO KILLER
Q286
From Vibrato Tab Pt. E See Dwg. 1
STRUM TRIGGER DISABLE
Q288
BOOGIE BASS TRIGGER
Q290
Q289
To CFG IC85 Pin 37 See This Dwg.
BOOGIE INTRO RESET
IC93A
STRUM TRIGGER GATES
IC92D
IC92C
IC92B
STRUM TRIGGER
Q291
To CFG IC85 Pin 15 See This Dwg.
Required on Harris IC's only
To Genie Bass Pulse Detector Q184 See Dwg. 11
Upbeat Strum Downbeat
Negative Pulse From ROM IC103 Pin 23 See Dwg. 15
INVERTER
IC92A
From Counter IC102 Pin 12 See Dwg. 15
1 of 3 Boogie Bass Contacts See This Dwg. & Dwg. 11
Negative Pulse From ROM IC103 Pin 22 See Dwg. 15
To CFG IC85 Pin 12 See This Dwg.
ARPEGGIO TRIGGER GATES
IC91A
IC91B
BOOGIE BASS TRIGGER GATES
IC91C
IC91D
D349
D350
D351
D352
UKULELE STRUM ENABLE
IC86D
1 of 2 Ukulele Strum Contacts See This Dwg.
ANY RHYTHM ON GATE
IC86C
To Golden Harp Rhythm Sync. Switch See Dwg. 22
To Genie Accomp. Switcher Q127 Thru Diode D193 See Dwg. 7
RHYTHM & INTRO ON SWITCHER
Q283
From Multi-Starter Circuit Pt. LU See Dwg. 15 (High with Rhythm off)
From Intro Latch Q320 Pt. MF See Dwg. 15 (High with Intro on)
To Strobe Keyers Pt. ME See Dwg. 15
STROBE DRIVER
Q292
STROBE GATE
IC88A
BOOGIE PULSE GATES
IC88B
IC88C
IC88D
BOOGIE BASS PULSE DIVIDERS
IC90B
IC90A
IC89B
IC89A
Positive Pulse From Strobe Delay Q325 Pt. MD See Dwg. 15
To Counter IC102 Pin 7 See Dwg. 15 & Rhythm Sync Switch Via D721 See Dwg 22
Rhythm Off Reset Line
From Clock Multi. Q297 Pt. LV See Dwg. 15
Negative Reset Pulse From Reset Inverter Q299 See Dwg. 15
Cymbal Decoder Enable To Q307 See Dwg. 15
From Counter IC102 Pin 10 See Dwg. 15
From Counter IC102 Pin 11 See Dwg. 15
Pts. KL Thru KS Ground With Switches Off
ARPEGGIO STRUM & BOOGIE TRIGGER GATE SELECTORS
Q284
Q285
D348
From Intro Latch Q320 Pt. MF See Dwg. 15 (High with Intro on)
From Swing Switch
From Dixie Switch See Dwg 15
From Shuffle Switch See Dwg. 15
From Swing Waltz Switch See Dwg. 15
From Waltz Switch See Dwg. 15
From Swing March Switch See Dwg. 15
D340
D341
D342
D343
D344
D345
D346
D347
+13V
+14V
LE
LR
LD
LC
LB
KW
KX
KY
KZ
LA
KV
KT
KU
KH
KJ
LS
KK
JK
JL
KL
KM
KN
KO
KP
KQ
KR
KS

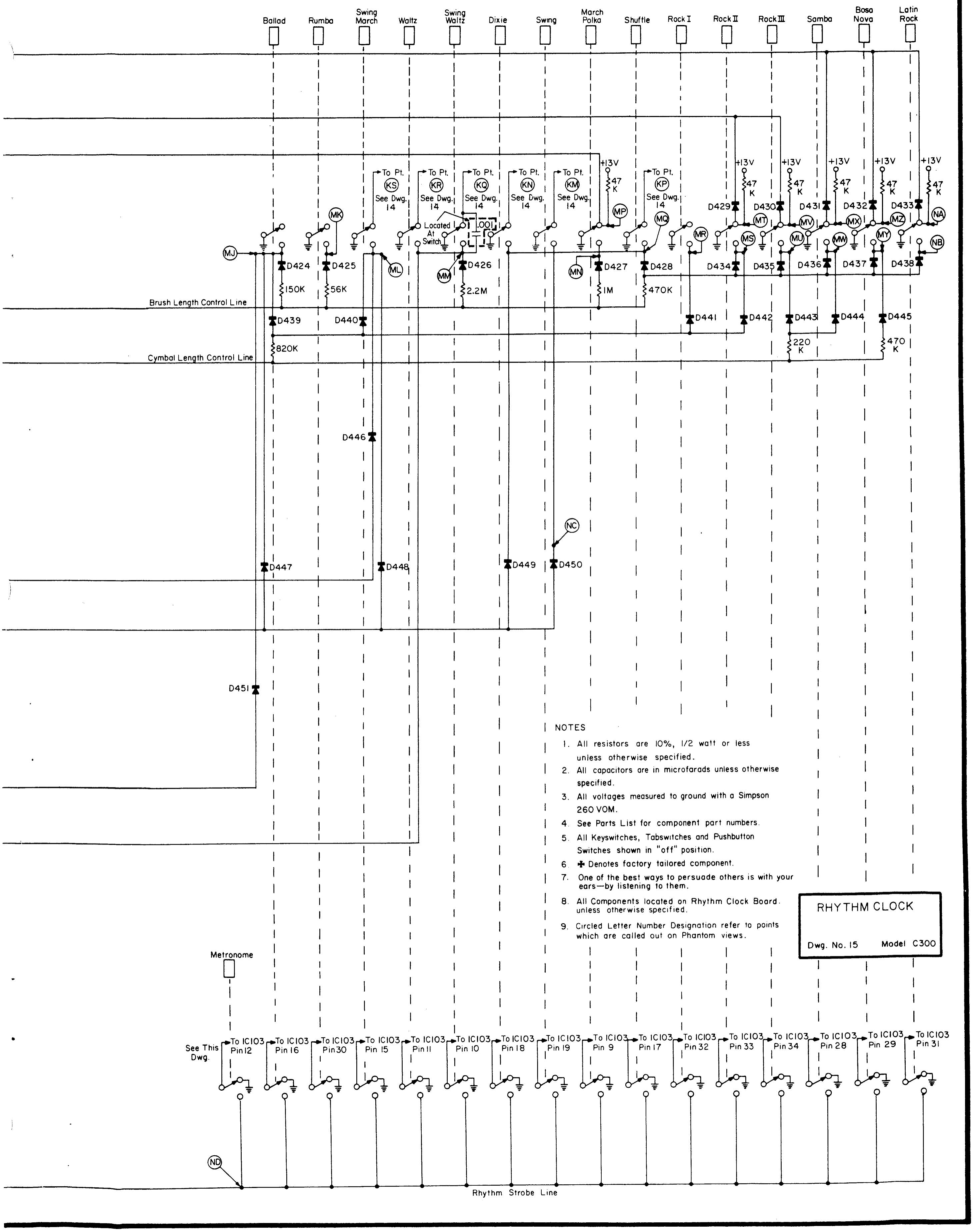
NOTES

1. All resistors are 10%, 1/2 watt or less unless otherwise specified
2. All Capacitors are in microfarads unless otherwise specified
3. All voltages measured to ground with a Simpson 260 VOM.
4. See Parts List for component part numbers
5. All Keyswitches, Tabswitches and Pushbutton Switches shown in "off" position
6. ✚ Denotes factory tailored component
7. All components located on Chord Function Generator Board unless otherwise specified
8. Resistors with "R" nos and "C" nos are contained in Networks

SCHEMATIC 15


MULTI-STARTER
Q295
+13V
2.2K
From Rhythm Start Switcher Q128 See Dwg. 7
LT
10K
10Ω
D378
D379
.05
33K
100K
.01
D380
D381
LU
To Q283 See Dwg. 14
Q299
RESET INVERTER
CLOCK MULTIVIBRATOR
D384
INTRO RESET
Q296
Q297
Q298
D382
D383
.01
4.7K
22K
.015
.27
180Ω
120K
150K
470Ω
÷2 D Flip-Flop Box Represents Part of IC89A See Dwg. 14
LV
LW
LX
Located At Tab Panel
VR43 Speed Control
1M
-13V
Clock Slow Down Line
220K
RESETABLE COUNTER
IC102
From Genie Bass Divider Driver Q183 See Dwg. 11
To Q186 See Dwg. 11
Reset To IC89 & IC90 Pt. KK See Dwg. 14
R.O.M.
IC103
Rock III
Rock II
Rock I
Latin Rock
Rhumba
Bosa Nova
Samba
March Polka
Swing Waltz
Waltz
Metronome
From Q327
From Q324
Swing March
Ballad
Shuffle
Dixie
Swing
See This Dwg.
To Pt. NU See Dwg. 16
NY
NV
NW
NZ
PA
PB
PD
To Pts. See Dwg. 16
To Pt. NX See Dwg. 16
To Pt. PC See Dwg. 16
Hi/Lo Bass Trigger
To Pt. KU See Dwg. 14
Part of Intro Switch
+24V
Downbeat & Intro Lamp
LZ
270Ω
DOWNBEAT & INTRO LAMP DRIVER
Q300
.39
1M
Samba Bosa Nova & Latin Rock Brush Decoder Enable Line
Q301
ROCK II & III BRUSH DECODER ENABLERS
Rock 2 & 3 Brush Decoder Enable Line
Q302
15K
March Polka Brush Decoder Enable Line
D385
D386
SAMBA, BOSA NOVA & LATIN ROCK BRUSH DECODER
Q303
47K
D387
To IC92A Pt. KX See Dwg. 14
To IC57B Pt. EF See Dwg. 7
To Brush Keyer Q342 See Dwg. 16
MA
150K
Q305
BRUSH LENGTH REGULATOR
D388
D389
Q304
ROCK II & III BRUSH DECODER
From Pt. KL See Dwg. 14
To Cymbal Keyer Q345 See Dwg. 16
MC
Q308
DIXIE & SWING CYMBAL DECODER
Q306
Q307
DIXIE & SWING CYMBAL LENGTH REGULATOR
D390
4.7K
Bass Select To Pt. GZ See Dwg. 11
MARCH POLKA BRUSH DECODER
MB
Accomp. Pulse To Strum Tab Pt. LA See Dwg. 14
+15V
910K
510K
D394
D391
33K
Q309
D393
GENIE MODULATOR KEYER
GENIE MODULATOR DRIVER
Q310
3.9K
Modulator Drive To Pt. EH See Dwg. 7
Located on Instrumentation Board See Note 8
Swing March Clock Slow-Down Line
Q311
SWING MARCH CLOCK SLOW-DOWN SWITCHER
2K 5%
Triplet Reset Line
TRIPLET CLOCK SLOW DOWN SWITCHER & RESET ENABLE
Q313
Triplet Enable Line
D395
D396
Q314
D397
D398
D399
To IC88D Pt. JK See Dwg. 14
To IC88D Pt. JL See Dwg. 14
TRIPLET RESET
D400
INTRO HOLD RESET
Q315
Q312
BALLAD INTRO CLOCK SLOW-DOWN SWITCHER
Ballad Intro, Slow-Down Enable Line
WALTZ CLOCK SLOW-DOWN SWITCHER & RESET ENABLE
Q316
Waltz Enable Line
D401
D402
D403
Waltz Reset Line
WALTZ RESET
Q317
D404
D405
Intro Clock Reset Line
INTRO END SWITCHER
D409
Q318
D410
INTRO LATCH
Q319
Intro Disable Line
Intro Switch (Momentary)
D412
D411
MH
MG
Q320
56K
D406
Intro End Rhythm Reset Line
Q322
Q321
INTRO SWITCHER
MF
Intro Bass & Strum Disable To Q283, Q284 & Q285 See Dwg. 14
330K
INTRO ENABLE
.0068
D407
Intro Resetable Counter Reset Line
D413
D414
RHYTHM STROBE DISABLE
Q328
Q323
INTRO 2 STROBE ENABLE
D415
INTRO 1 STROBE ENABLE
D416
D417
D418
Q326
D421
Ballad Intro Slowdown Switcher B+ Supply Line
Q327
INTRO 1 STROBE KEYER
RHYTHM STROBE KEYER
ME
D419
Q324
INTRO 2 STROBE KEYER
D420
D422
D423
Q329
Box Represents Strobe Gate IC88A & Strobe Driver Q292 See Dwg. 14
MD
D408
Q325
STROBE DELAY
Intro 1 Clock Slowdown Line
To Pin 14 IC103 See This Dwg.
To Pin 13 IC103 See This Dwg.
470Ω

SCHEMATIC 15



Ballad
Rumba
Swing March
Waltz
Swing Waltz
Dixie
Swing
March Polka
Shuffle
Rock I
Rock II
Rock III
Samba
Bosa Nova
Latin Rock
To Pt. KS See Dwg. 14
To Pt. KR See Dwg. 14
To Pt. KQ See Dwg. 14
To Pt. KN See Dwg. 14
To Pt. KM See Dwg. 14
To Pt. KP See Dwg. 14
Located At Switch
.001
+13V
47 K
MJ
MK
ML
MM
MN
MP
MQ
MR
MS
MT
MU
MV
MW
MX
MY
MZ
NA
NB
NC
ND
D424
D425
D426
D427
D428
D429
D430
D431
D432
D433
D434
D435
D436
D437
D438
D439
D440
D441
D442
D443
D444
D445
D446
D447
D448
D449
D450
D451
150K
56K
2.2M
1M
470K
820K
220 K
470 K
Brush Length Control Line
Cymbal Length Control Line
Metronome
See This Dwg.
To IC103 Pin 12
To IC103 Pin 16
To IC103 Pin 30
To IC103 Pin 15
To IC103 Pin 11
To IC103 Pin 10
To IC103 Pin 18
To IC103 Pin 19
To IC103 Pin 9
To IC103 Pin 17
To IC103 Pin 32
To IC103 Pin 33
To IC103 Pin 34
To IC103 Pin 28
To IC103 Pin 29
To IC103 Pin 31
Rhythm Strobe Line

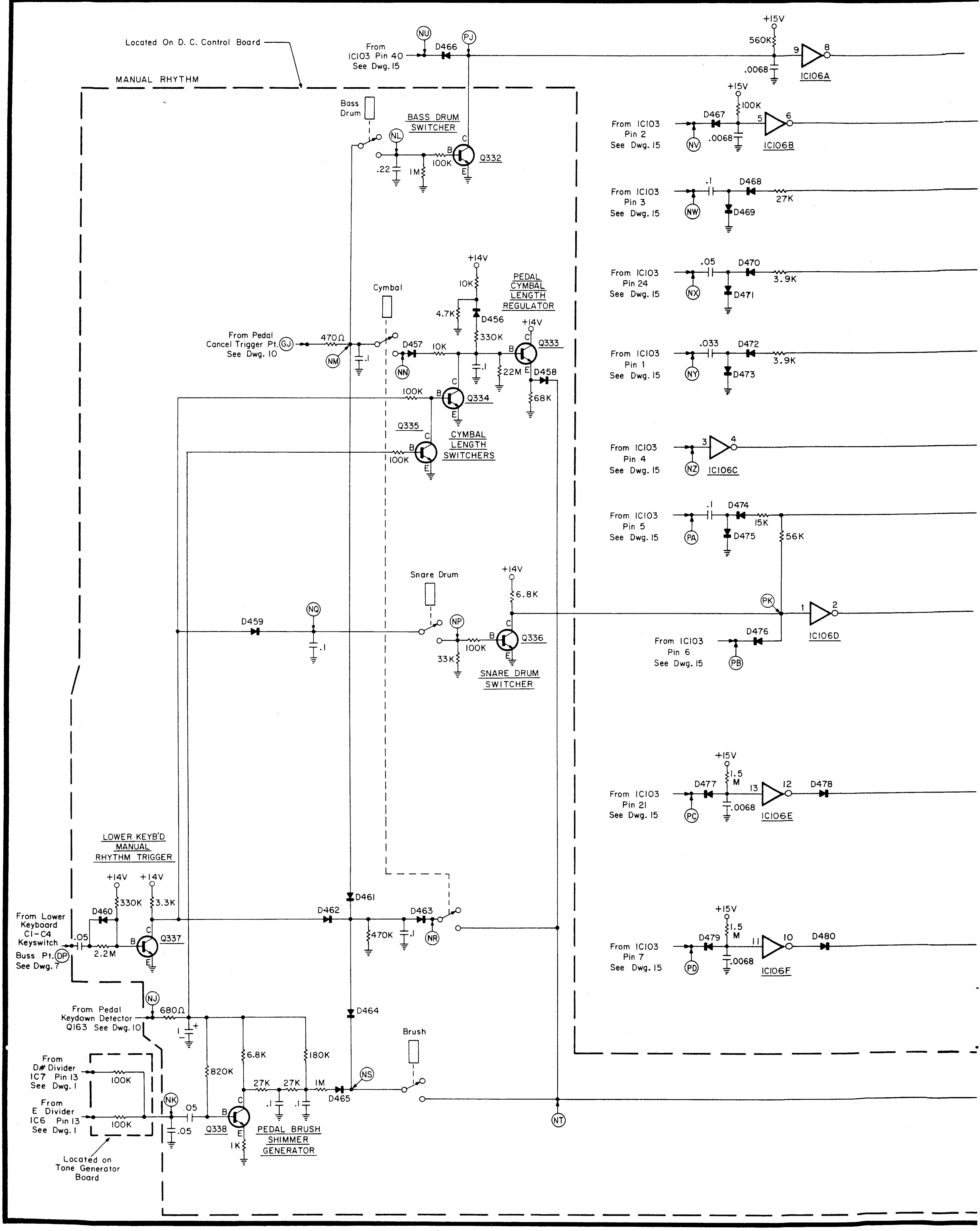
NOTES

1. All resistors are 10%, 1/2 watt or less unless otherwise specified.
2. All capacitors are in microfarads unless otherwise specified.
3. All voltages measured to ground with a Simpson 260 VOM.
4. See Parts List for component part numbers.
5. All Keyswitches, Tabswitches and Pushbutton Switches shown in "off" position.
6. ✚ Denotes factory tailored component.
7. One of the best ways to persuade others is with your ears—by listening to them.
8. All Components located on Rhythm Clock Board unless otherwise specified.
9. Circled Letter Number Designation refer to points which are called out on Phantom views.

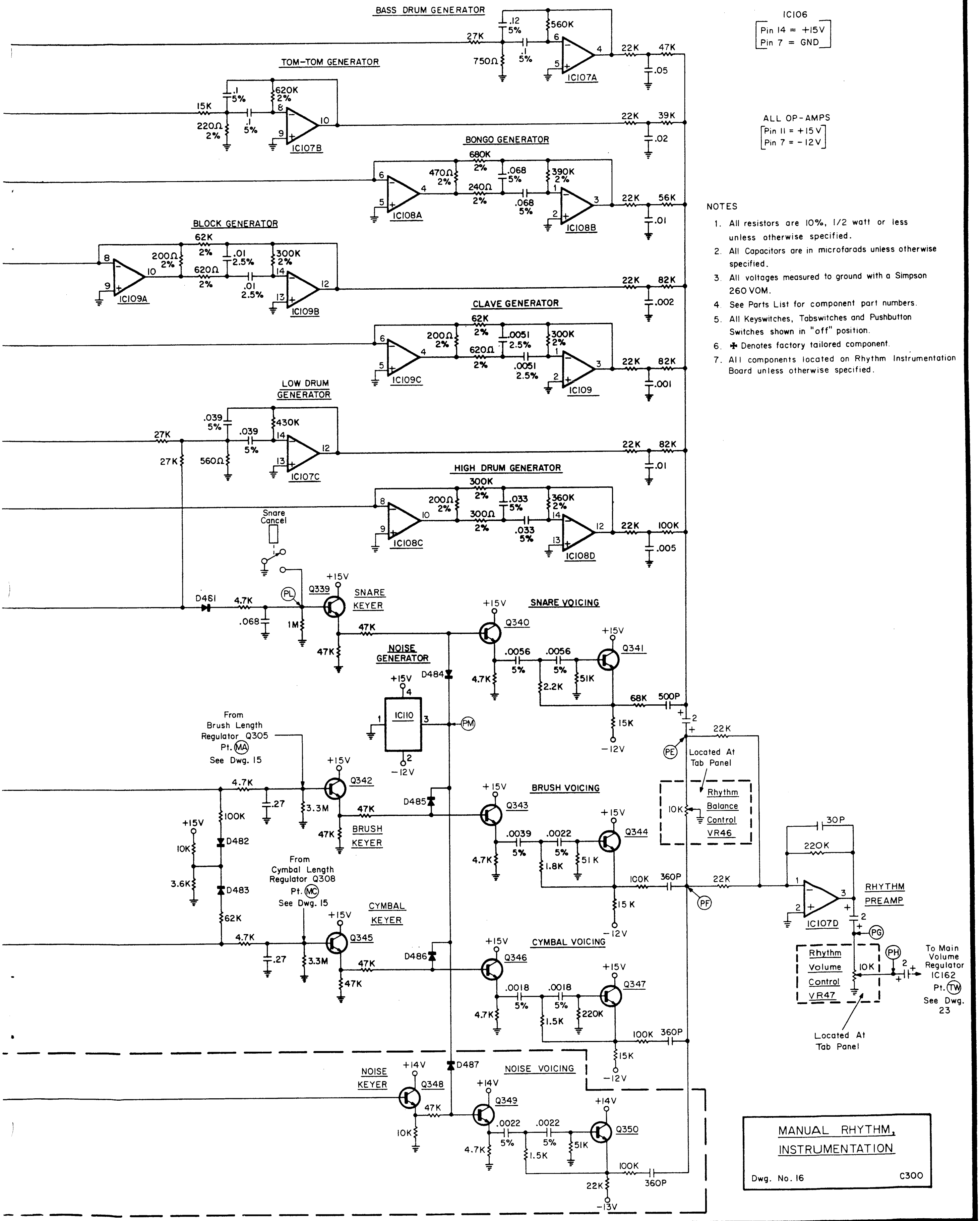
RHYTHM CLOCK

Dwg. No. 15 Model C300

SCHEMATIC 16


Located On D. C. Control Board
MANUAL RHYTHM
From IC103 Pin 40 See Dwg. 15
NU
D466
PJ
+15V
560K
9
8
.0068
IC106A
Bass Drum
BASS DRUM SWITCHER
NL
B
C
E
100K
Q332
.22
1M
+15V
100K
From IC103 Pin 2 See Dwg. 15
D467
5
6
.0068
NV
IC106B
From IC103 Pin 3 See Dwg. 15
.1
D468
27K
NW
D469
From IC103 Pin 24 See Dwg. 15
.05
D470
3.9K
NX
D471
+14V
10K
Cymbal
PEDAL CYMBAL LENGTH REGULATOR
4.7K
D456
+14V
330K
From Pedal Cancel Trigger Pt. GJ See Dwg. 10
470Ω
NM
.1
D457
10K
NN
.1
22M
Q333
D458
68K
100K
Q334
Q335
CYMBAL LENGTH SWITCHERS
100K
From IC103 Pin 1 See Dwg. 15
.033
D472
3.9K
NY
D473
From IC103 Pin 4 See Dwg. 15
3
4
NZ
IC106C
From IC103 Pin 5 See Dwg. 15
.1
D474
15K
PA
D475
56K
Snare Drum
+14V
6.8K
D459
NQ
.1
NP
100K
33K
Q336
SNARE DRUM SWITCHER
PK
1
2
IC106D
D476
From IC103 Pin 6 See Dwg. 15
PB
+15V
1.5 M
From IC103 Pin 21 See Dwg. 15
D477
13
12
D478
.0068
PC
IC106E
LOWER KEYB'D MANUAL RHYTHM TRIGGER
+14V
+14V
330K
3.3K
D460
From Lower Keyboard C1-C4 Keyswitch Buss Pt. DP See Dwg. 7
.05
2.2M
Q337
D461
D462
470K
D463
.1
NR
+15V
1.5 M
From IC103 Pin 7 See Dwg. 15
D479
11
10
D480
.0068
PD
IC106F
NJ
From Pedal Keydown Detector Q163 See Dwg. 10
680Ω
1
+
D464
Brush
From D# Divider IC7 Pin 13 See Dwg. 1
100K
From E Divider IC6 Pin 13 See Dwg. 1
100K
Located on Tone Generator Board
NK
.05
.05
820K
6.8K
180K
27K
27K
1M
D465
NS
Q338
1K
PEDAL BRUSH SHIMMER GENERATOR
NT

SCHEMATIC 16


BASS DRUM GENERATOR
27K
.12 5%
560K
750Ω
.1 5%
IC107A
TOM-TOM GENERATOR
15K
220Ω 2%
.1 5%
620K 2%
IC107B
22K
47K
.05
39K
.02
BONGO GENERATOR
680K 2%
470Ω 2%
240Ω 2%
.068 5%
390K 2%
IC108A
IC108B
56K
.01
BLOCK GENERATOR
62K 2%
200Ω 2%
620Ω 2%
.01 2.5%
300K 2%
IC109A
IC109B
82K
.002
CLAVE GENERATOR
62K 2%
200Ω 2%
620Ω 2%
.0051 2.5%
300K 2%
IC109C
IC109
.001
LOW DRUM GENERATOR
.039 5%
430K
27K
560Ω
IC107C
HIGH DRUM GENERATOR
300K 2%
200Ω 2%
300Ω 2%
.033 5%
360K 2%
IC108C
IC108D
100K
.005
Snare Cancel
D461
4.7K
.068
1M
PL
Q339
SNARE KEYER
+15V
47K
NOISE GENERATOR
D484
IC110
PM
-12V
SNARE VOICING
Q340
Q341
.0056 5%
2.2K
51K
68K
500P
15K
PE
Located At Tab Panel
Rhythm Balance Control VR46
10K
From Brush Length Regulator Q305 Pt. MA See Dwg. 15
Q342
.27
3.3M
D485
BRUSH KEYER
100K
D482
D483
3.6K
62K
BRUSH VOICING
Q343
Q344
.0039 5%
.0022 5%
1.8K
51 K
360P
PF
From Cymbal Length Regulator Q308 Pt. MC See Dwg. 15
CYMBAL KEYER
Q345
D486
CYMBAL VOICING
Q346
Q347
.0018 5%
1.5K
220K
NOISE KEYER
+14V
Q348
D487
NOISE VOICING
Q349
Q350
.0022 5%
22K
-13V
30P
220K
IC107D
RHYTHM PREAMP
PG
PH
Rhythm Volume Control VR47
To Main Volume Regulator IC162 Pt. TW See Dwg. 23
Located At Tab Panel

IC106
Pin 14 = +15V
Pin 7 = GND

ALL OP-AMPS
Pin 11 = +15 V
Pin 7 = -12 V

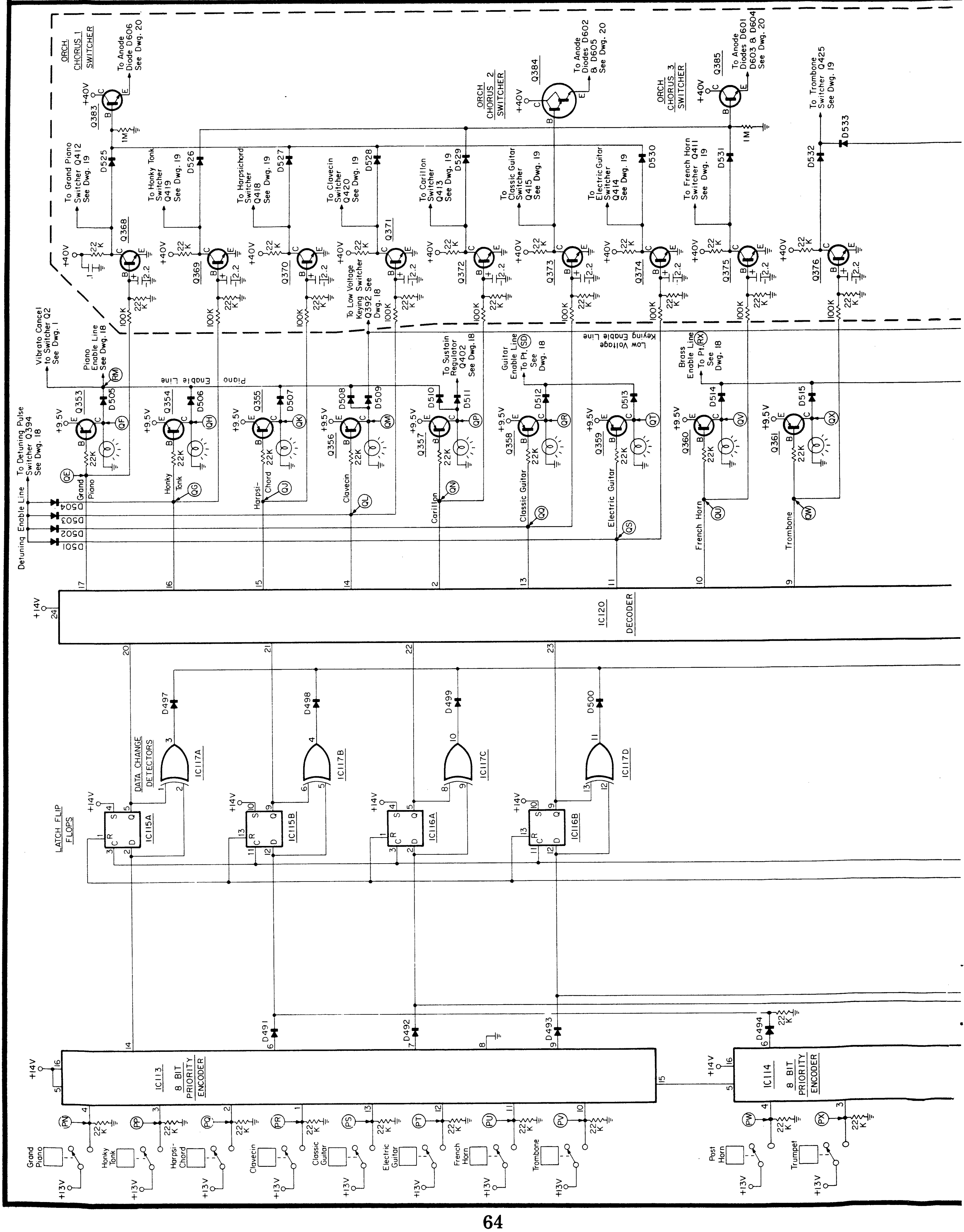
NOTES

1. All resistors are 10%, 1/2 watt or less unless otherwise specified.
2. All Capacitors are in microfarads unless otherwise specified.
3. All voltages measured to ground with a Simpson 260 VOM.
4. See Parts List for component part numbers.
5. All Keyswitches, Tabswitches and Pushbutton Switches shown in "off" position.
6. ✣ Denotes factory tailored component.
7. All components located on Rhythm Instrumentation Board unless otherwise specified.

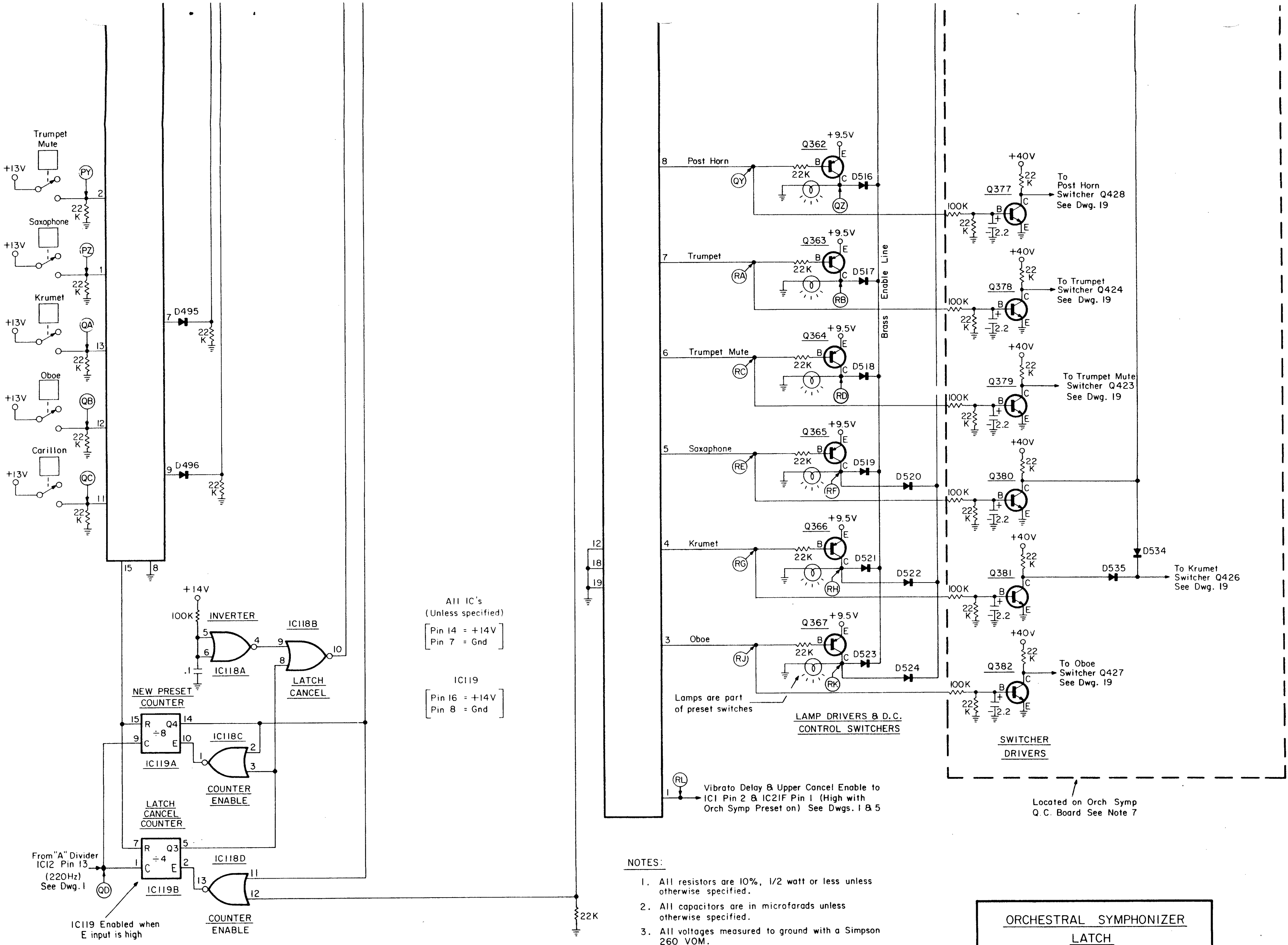
MANUAL RHYTHM, INSTRUMENTATION

Dwg. No. 16 C300

SCHEMATIC 17


ORCH. CHORUS 1 SWITCHER
ORCH. CHORUS 2 SWITCHER
ORCH. CHORUS 3 SWITCHER
Q383
Q384
Q385
To Anode Diode D606 See Dwg. 20
To Anode Diodes D602 & D605 See Dwg. 20
To Anode Diodes D601 D603 & D604 See Dwg. 20
To Trombone Switcher Q425 See Dwg. 19
To Grand Piano Switcher Q412 See Dwg. 19
To Honky Tonk Switcher Q419 See Dwg. 19
To Harpsichord Switcher Q418 See Dwg. 19
To Clavecin Switcher Q420 See Dwg. 19
To Carillon Switcher Q413 See Dwg. 19
To Classic Guitar Switcher Q415 See Dwg. 19
To Electric Guitar Switcher Q414 See Dwg. 19
To French Horn Switcher Q411 See Dwg. 19
D525
D526
D527
D528
D529
D530
D531
D532
D533
Q368
Q369
Q370
Q371
Q372
Q373
Q374
Q375
Q376
+40V
22K
1M
2.2
100K
To Low Voltage Keying Switcher Q392 See Dwg. 18
Vibrato Cancel to Switcher Q2 See Dwg. 1
Piano Enable Line See Dwg. 18
Piano Enable Line
To Sustain Regulator Q402 See Dwg. 18
Guitar Enable Line To Pt. SD See Dwg. 18
Low Voltage Keying Enable Line
Brass Enable Line To Pt. RX See Dwg. 18
To Detuning Pulse Switcher Q394 See Dwg. 18
Q353
Q354
Q355
Q356
Q357
Q358
Q359
Q360
Q361
+9.5V
D505
D506
D507
D508
D509
D510
D511
D512
D513
D514
D515
RM
QE
QF
QG
QH
QJ
QK
QL
QM
QN
QP
QQ
QR
QS
QT
QU
QV
QW
QX
Grand Piano
Honky Tonk
Harpsi-Chord
Clavecin
Carillon
Classic Guitar
Electric Guitar
French Horn
Trombone
Detuning Enable Line
D501
D502
D503
D504
+14V
IC120 DECODER
DATA CHANGE DETECTORS
LATCH FLIP FLOPS
IC117A
IC117B
IC117C
IC117D
D497
D498
D499
D500
IC115A
IC115B
IC116A
IC116B
D491
D492
D493
D494
IC113 8 BIT PRIORITY ENCODER
IC114 8 BIT PRIORITY ENCODER
PN
PP
PQ
PR
PS
PT
PU
PV
PW
PX
Post Horn
Trumpet
+13V

SCHEMATIC 17


Trumpet Mute
Saxophone
Krumet
Oboe
Carillon
+13V
PY
PZ
QA
QB
QC
22 K
D495
D496
+14V
100K
INVERTER
IC118A
IC118B
LATCH CANCEL
NEW PRESET COUNTER
R Q4 ÷8 C E
IC119A
IC118C
COUNTER ENABLE
LATCH CANCEL COUNTER
R Q3 ÷4 C E
IC119B
IC118D
COUNTER ENABLE
From "A" Divider IC12 Pin 13 (220Hz) See Dwg. I
QD
IC119 Enabled when E input is high
.1
All IC's (Unless specified)
Pin 14 = +14V
Pin 7 = Gnd
IC119
Pin 16 = +14V
Pin 8 = Gnd
22K
Post Horn
Trumpet
Trumpet Mute
Saxophone
Krumet
Oboe
QY
RA
RC
RE
RG
RJ
Q362
Q363
Q364
Q365
Q366
Q367
+9.5V
22K
QZ
RB
RD
RF
RH
RK
D516
D517
D518
D519
D520
D521
D522
D523
D524
Brass Enable Line
Lamps are part of preset switches
LAMP DRIVERS & D.C. CONTROL SWITCHERS
RL
Vibrato Delay & Upper Cancel Enable to IC1 Pin 2 & IC21F Pin 1 (High with Orch Symp Preset on) See Dwgs. 1 & 5
Q377
Q378
Q379
Q380
Q381
Q382
+40V
22 K
100K
2.2
To Post Horn Switcher Q428 See Dwg. 19
To Trumpet Switcher Q424 See Dwg. 19
To Trumpet Mute Switcher Q423 See Dwg. 19
D534
D535
To Krumet Switcher Q426 See Dwg. 19
To Oboe Switcher Q427 See Dwg. 19
SWITCHER DRIVERS
Located on Orch Symp Q.C. Board See Note 7

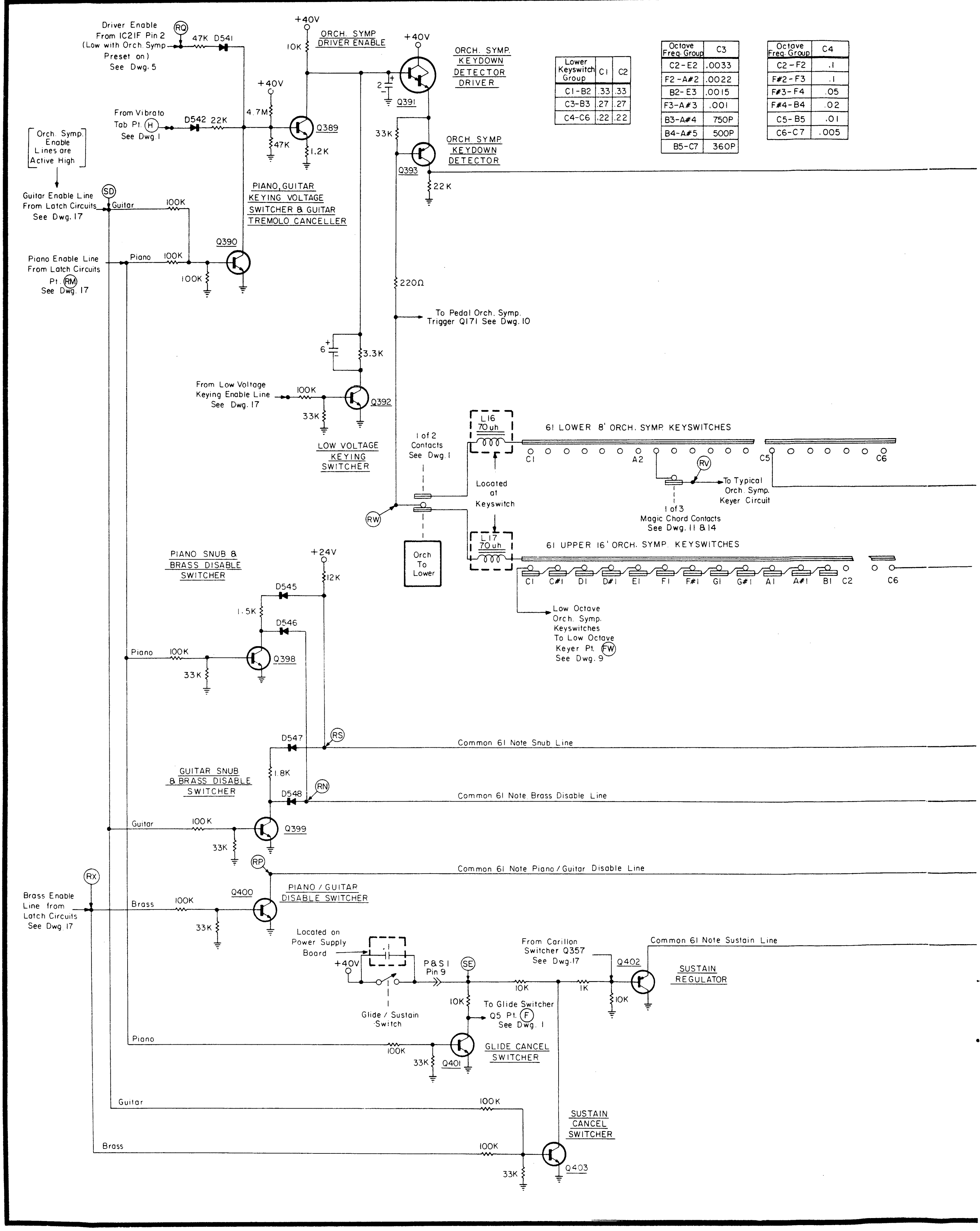
NOTES:

1. All resistors are 10%, 1/2 watt or less unless otherwise specified.
2. All capacitors are in microfarads unless otherwise specified.
3. All voltages measured to ground with a Simpson 260 VOM.
4. See Parts List for component part numbers.
5. All keyswitches, tabswitches and pushbutton switches are shown in "off" position.
6. ✚ Denotes factory tailored component.
7. All components located on Orch. Symp. Latch & Control Board unless otherwise specified.

ORCHESTRAL SYMPHONIZER
LATCH

Dwg. No. 17
Model C300

SCHEMATIC 18

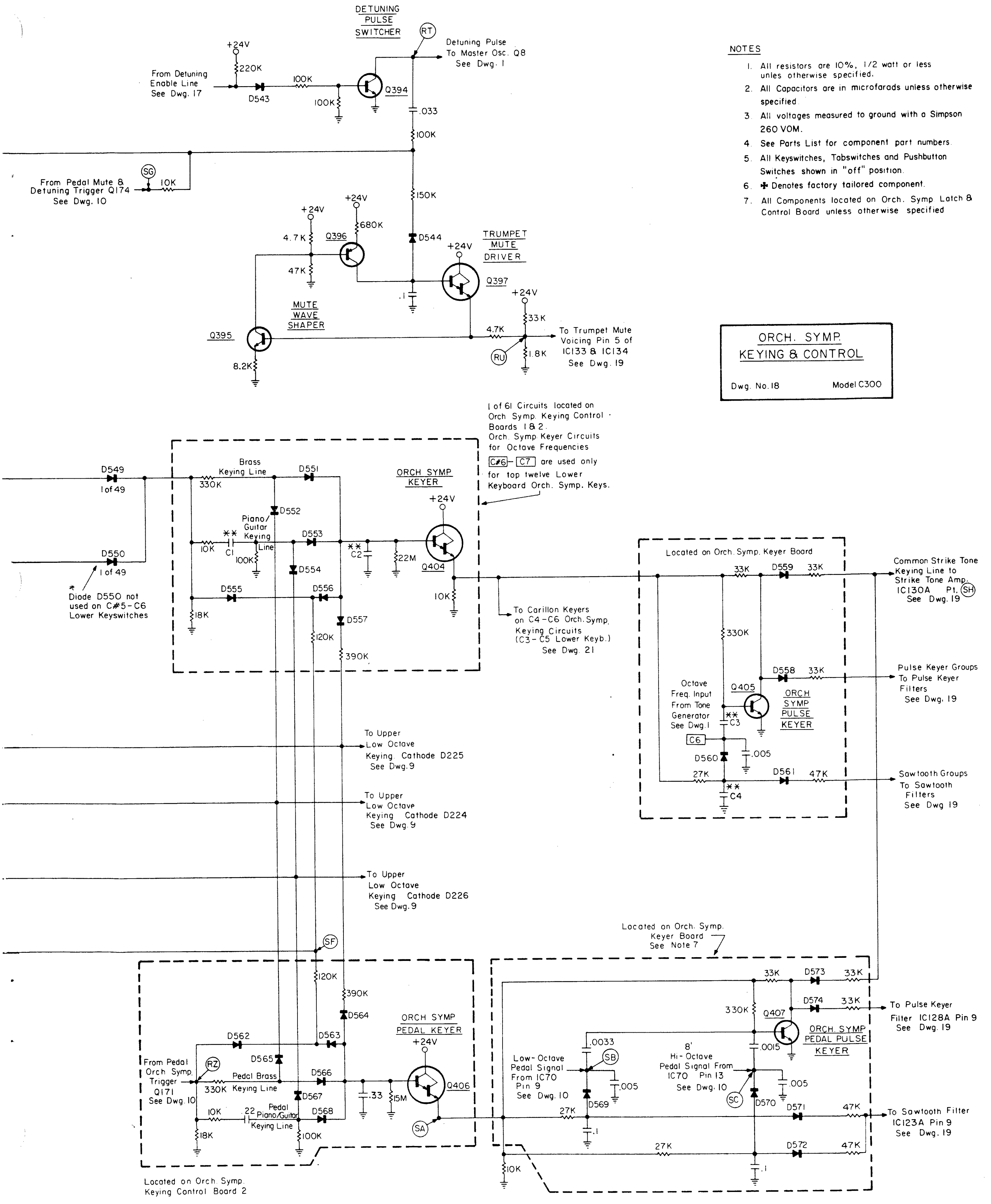

Driver Enable
From IC21F Pin 2
(Low with Orch. Symp.
Preset on)
See Dwg. 5
RQ
47K
D541
+40V
ORCH. SYMP.
DRIVER ENABLE
10K
+40V
ORCH. SYMP.
KEYDOWN
DETECTOR
DRIVER
2
Q391
+40V
4.7M
Q389
47K
1.2K
From Vibrato
Tab Pt. H
See Dwg. 1
D542
22K
Orch. Symp.
Enable
Lines are
Active High
33K
Q393
ORCH. SYMP.
KEYDOWN
DETECTOR
22K
Guitar Enable Line
From Latch Circuits
See Dwg. 17
SD
Guitar
100K
PIANO, GUITAR
KEYING VOLTAGE
SWITCHER & GUITAR
TREMOLO CANCELLER
Q390
Piano Enable Line
From Latch Circuits
Pt. RM
See Dwg. 17
Piano
100K
100K
220Ω
To Pedal Orch. Symp.
Trigger Q171 See Dwg. 10
6
3.3K
From Low Voltage
Keying Enable Line
See Dwg. 17
100K
Q392
33K
LOW VOLTAGE
KEYING
SWITCHER
L16
70uh
61 LOWER 8' ORCH. SYMP. KEYSWITCHES
1 of 2
Contacts
See Dwg. 1
C1
A2
C5
C6
RV
Located
at
Keyswitch
To Typical
Orch. Symp.
Keyer Circuit
1 of 3
Magic Chord Contacts
See Dwg. 11 & 14
RW
L17
70uh
61 UPPER 16' ORCH. SYMP. KEYSWITCHES
Orch
To
Lower
C1
C#1
D1
D#1
E1
F1
F#1
G1
G#1
A1
A#1
B1
C2
C6
Low Octave
Orch. Symp.
Keyswitches
To Low Octave
Keyer Pt. FW
See Dwg. 9
PIANO SNUB &
BRASS DISABLE
SWITCHER
+24V
12K
D545
1.5K
D546
Piano
100K
Q398
33K
D547
RS
Common 61 Note Snub Line
GUITAR SNUB
& BRASS DISABLE
SWITCHER
1.8K
D548
RN
Common 61 Note Brass Disable Line
Guitar
100K
Q399
33K
RP
Common 61 Note Piano/Guitar Disable Line
RX
Brass Enable
Line from
Latch Circuits
See Dwg. 17
Q400
PIANO / GUITAR
DISABLE SWITCHER
Brass
100K
33K
Located on
Power Supply
Board
.1
+40V
P&S1
Pin 9
SE
From Carillon
Switcher Q357
See Dwg. 17
Common 61 Note Sustain Line
Q402
SUSTAIN
REGULATOR
10K
1K
10K
10K
To Glide Switcher
Q5 Pt. F
See Dwg. 1
Glide / Sustain
Switch
Piano
100K
GLIDE CANCEL
SWITCHER
33K
Q401
Guitar
100K
SUSTAIN
CANCEL
SWITCHER
Brass
100K
Q403
33K

Lower Keyswitch Group	C1	C2
C1-B2	.33	.33
C3-B3	.27	.27
C4-C6	.22	.22

Octave Freq. Group	C3
C2-E2	.0033
F2-A#2	.0022
B2-E3	.0015
F3-A#3	.001
B3-A#4	750P
B4-A#5	500P
B5-C7	360P

Octave Freq. Group	C4
C2-F2	.1
F#2-F3	.1
F#3-F4	.05
F#4-B4	.02
C5-B5	.01
C6-C7	.005

SCHEMATIC 18


DETUNING PULSE SWITCHER
RT
+24V
220K
From Detuning Enable Line See Dwg. 17
D543
100K
100K
Q394
Detuning Pulse To Master Osc. Q8 See Dwg. 1
.033
100K
SG
From Pedal Mute & Detuning Trigger Q174 See Dwg. 10
10K
150K
+24V
680K
4.7K
Q396
47K
D544
TRUMPET MUTE DRIVER
Q397
.1
MUTE WAVE SHAPER
Q395
8.2K
33K
4.7K
RU
1.8K
To Trumpet Mute Voicing Pin 5 of IC133 & IC134 See Dwg. 19
1 of 61 Circuits located on Orch. Symp. Keying Control Boards 1 & 2.
Orch. Symp Keyer Circuits for Octave Frequencies C#6 - C7 are used only for top twelve Lower Keyboard Orch. Symp. Keys.
D549
1 of 49
Brass Keying Line
330K
D551
ORCH SYMP KEYER
D552
Piano/ Guitar Keying Line
** C1
10K
100K
D553
** C2
22M
Q404
D550
1 of 49
* Diode D550 not used on C#5-C6 Lower Keyswitches
D555
D556
D554
18K
D557
120K
390K
10K
To Carillon Keyers on C4-C6 Orch. Symp. Keying Circuits (C3-C5 Lower Keyb.) See Dwg. 21
Located on Orch. Symp. Keyer Board
33K
D559
33K
Common Strike Tone Keying Line to Strike Tone Amp. IC130A Pt. SH See Dwg. 19
330K
D558
33K
Pulse Keyer Groups To Pulse Keyer Filters See Dwg. 19
Octave Freq. Input From Tone Generator See Dwg. 1
Q405
ORCH SYMP PULSE KEYER
** C3
C6
D560
.005
27K
D561
47K
** C4
Sawtooth Groups To Sawtooth Filters See Dwg 19
To Upper Low Octave Keying Cathode D225 See Dwg. 9
To Upper Low Octave Keying Cathode D224 See Dwg. 9
To Upper Low Octave Keying Cathode D226 See Dwg. 9
Located on Orch. Symp. Keyer Board See Note 7
SF
120K
390K
D564
ORCH SYMP PEDAL KEYER
+24V
D562
D563
D565
RZ
From Pedal Orch. Symp. Trigger Q171 See Dwg. 10
Pedal Brass Keying Line
330K
D566
D567
.33
15M
Q406
10K
.22
Pedal Piano/Guitar Keying Line
D568
18K
100K
SA
Located on Orch. Symp. Keying Control Board 2
33K
D573
33K
D574
33K
To Pulse Keyer Filter IC128A Pin 9 See Dwg. 19
330K
Q407
ORCH SYMP PEDAL PULSE KEYER
.0033
.0015
Low-Octave Pedal Signal From IC70 Pin 9 See Dwg. 10
SB
.005
D569
8' Hi-Octave Pedal Signal From IC70 Pin 13 See Dwg. 10
SC
D570
.005
27K
D571
47K
To Sawtooth Filter IC123A Pin 9 See Dwg. 19
.1
27K
D572
47K
10K
.1

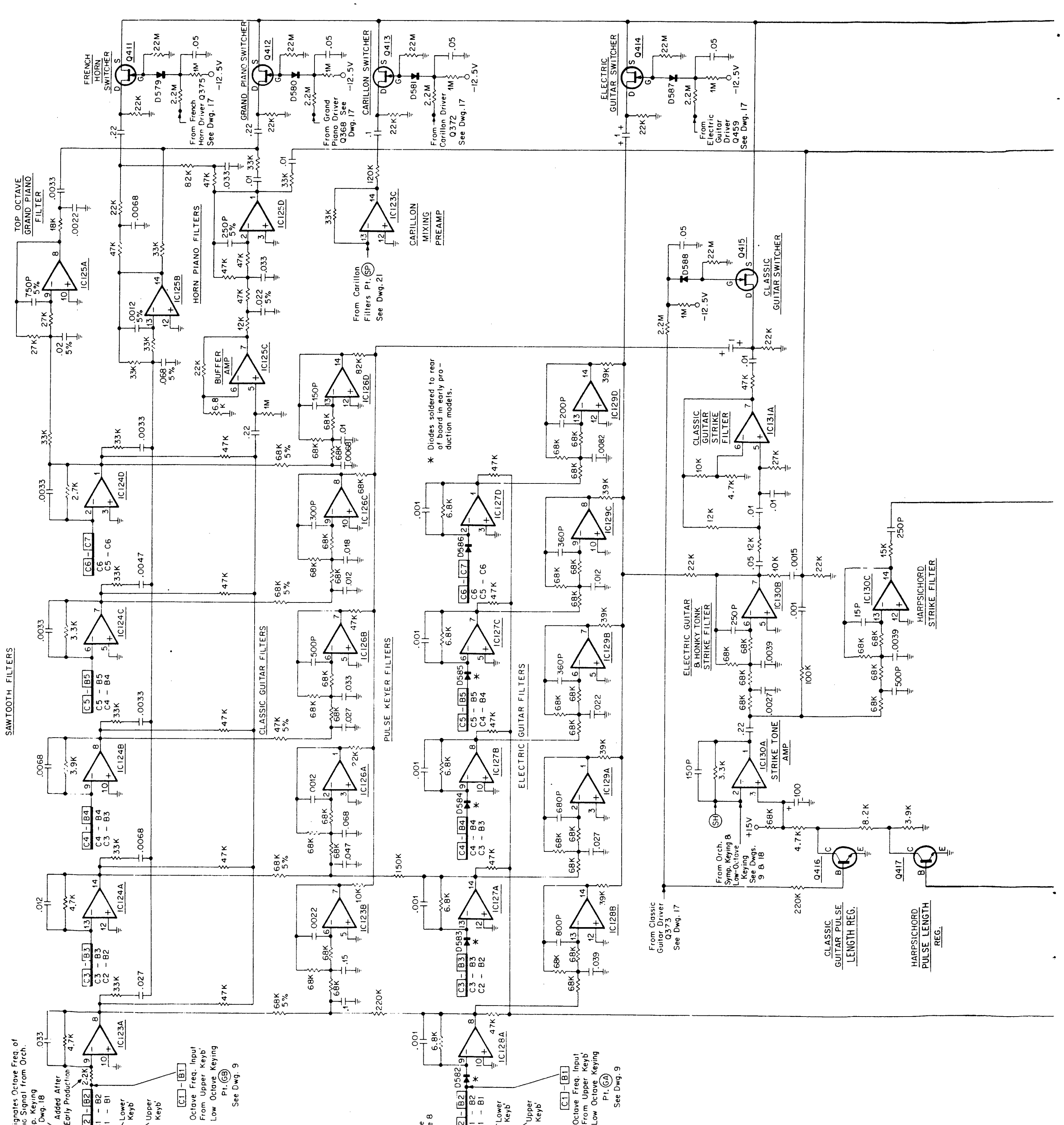
NOTES

1. All resistors are 10%, 1/2 watt or less unles otherwise specified.
2. All Capacitors are in microfarads unless otherwise specified.
3. All voltages measured to ground with a Simpson 260 VOM.
4. See Parts List for component part numbers.
5. All Keyswitches, Tabswitches and Pushbutton Switches shown in "off" position.
6. ✚ Denotes factory tailored component.
7. All Components located on Orch. Symp Latch & Control Board unless otherwise specified

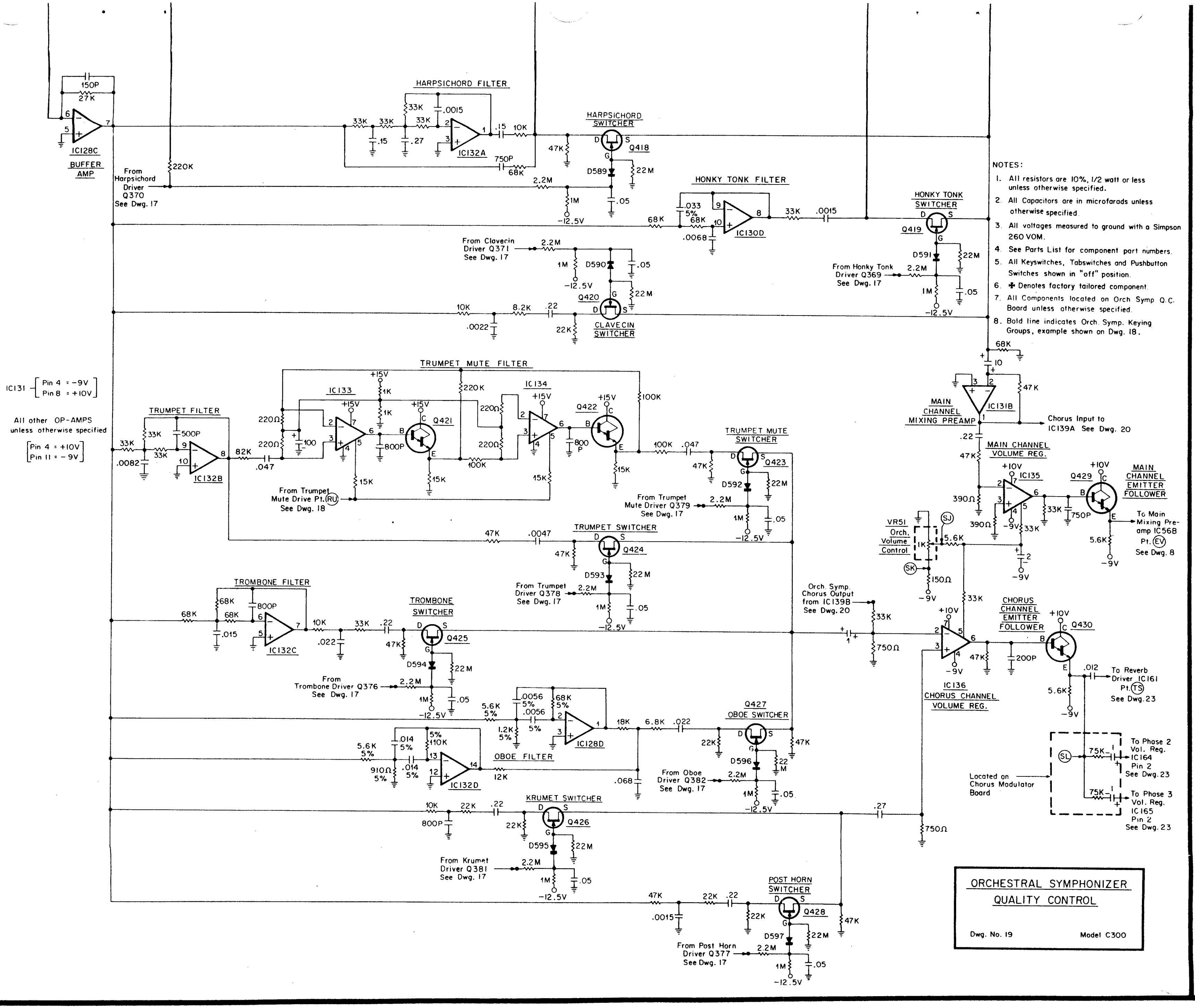
ORCH. SYMP.
KEYING & CONTROL

Dwg. No. 18 Model C300

SCHEMATIC 19


FRENCH HORN SWITCHER
Q411
D579
From French Horn Driver Q375 See Dwg. 17
GRAND PIANO SWITCHER
Q412
D580
From Grand Piano Driver Q368 See Dwg. 17
CARILLON SWITCHER
Q413
D581
From Carillon Driver Q372 See Dwg. 17
ELECTRIC GUITAR SWITCHER
Q414
D587
From Electric Guitar Driver Q459 See Dwg. 17
-12.5V
TOP OCTAVE GRAND PIANO FILTER
IC125A
HORN PIANO FILTERS
IC125B
IC125D
BUFFER AMP
IC125C
CARILLON MIXING PREAMP
IC123C
From Carillon Filters Pt. SP See Dwg. 21
CLASSIC GUITAR SWITCHER
Q415
D588
CLASSIC GUITAR STRIKE FILTER
IC131A
ELECTRIC GUITAR & HONKY TONK STRIKE FILTER
IC130B
HARPSICHORD STRIKE FILTER
IC130C
STRIKE TONE AMP
IC130A
From Orch. Symp. Keying & Low-Octave Keying See Dwgs. 9 & 18
+15V
Q416
CLASSIC GUITAR PULSE LENGTH REG.
Q417
HARPSICHORD PULSE LENGTH REG.
From Classic Guitar Driver Q373 See Dwg. 17
SAWTOOTH FILTERS
IC124D
IC124C
IC124B
IC124A
IC123A
CLASSIC GUITAR FILTERS
IC126D
IC126C
IC126B
IC126A
IC123B
PULSE KEYER FILTERS
IC127D
IC127C
IC127B
IC127A
IC128A
D582
D583
D584
D585
D586
ELECTRIC GUITAR FILTERS
IC129D
IC129C
IC129B
IC129A
IC128B
* Diodes soldered to rear of board in early production models.
C6 - C7
C5 - C6
C5 - B5
C4 - B4
C4 - B4
C3 - B3
C3 - B3
C2 - B2
C2 - B2
C1 - B1
Lower Keyb'
Upper Keyb'
C1 - B1
Octave Freq. Input From Upper Keyb' Low Octave Keying Pt. GB See Dwg. 9
Octave Freq. Input From Upper Keyb' Low Octave Keying Pt. GA See Dwg. 9
Designates Octave Freq. of Audio Signal from Orch. Symp. Keying See Dwg. 18
Added After Early Production
See Note 8

SCHEMATIC 19


IC128C
BUFFER AMP
150P
27K
From Harpsichord Driver Q370 See Dwg. 17
220K
HARPSICHORD FILTER
IC132A
HARPSICHORD SWITCHER
Q418
D589
HONKY TONK FILTER
IC130D
HONKY TONK SWITCHER
Q419
D591
From Honky Tonk Driver Q369 See Dwg. 17
From Clavecin Driver Q371 See Dwg. 17
D590
Q420
CLAVECIN SWITCHER
MAIN CHANNEL MIXING PREAMP
IC131B
Chorus Input to IC139A See Dwg. 20
MAIN CHANNEL VOLUME REG.
IC135
Q429
MAIN CHANNEL EMITTER FOLLOWER
To Main Mixing Pre-amp IC56B Pt. (EV) See Dwg. 8
VR51 Orch. Volume Control
TRUMPET MUTE FILTER
IC133
IC134
Q421
Q422
TRUMPET FILTER
IC132B
From Trumpet Mute Drive Pt. (RU) See Dwg. 18
TRUMPET MUTE SWITCHER
Q423
D592
From Trumpet Mute Driver Q379 See Dwg. 17
TRUMPET SWITCHER
Q424
D593
From Trumpet Driver Q378 See Dwg. 17
Orch Symp. Chorus Output from IC139B See Dwg. 20
CHORUS CHANNEL EMITTER FOLLOWER
Q430
IC136
CHORUS CHANNEL VOLUME REG.
To Reverb Driver IC161 Pt. (TS) See Dwg. 23
To Phase 2 Vol. Reg. IC164 Pin 2 See Dwg. 23
To Phase 3 Vol. Reg. IC165 Pin 2 See Dwg. 23
Located on Chorus Modulator Board
TROMBONE FILTER
IC132C
TROMBONE SWITCHER
Q425
D594
From Trombone Driver Q376 See Dwg. 17
OBOE FILTER
IC128D
IC132D
Q427
OBOE SWITCHER
D596
From Oboe Driver Q382 See Dwg. 17
KRUMET SWITCHER
Q426
D595
From Krumet Driver Q381 See Dwg. 17
POST HORN SWITCHER
Q428
D597
From Post Horn Driver Q377 See Dwg. 17

IC131 [Pin 4 = −9V, Pin 8 = +10V]

All other OP-AMPS unless otherwise specified [Pin 4 = +10V, Pin 11 = −9V]

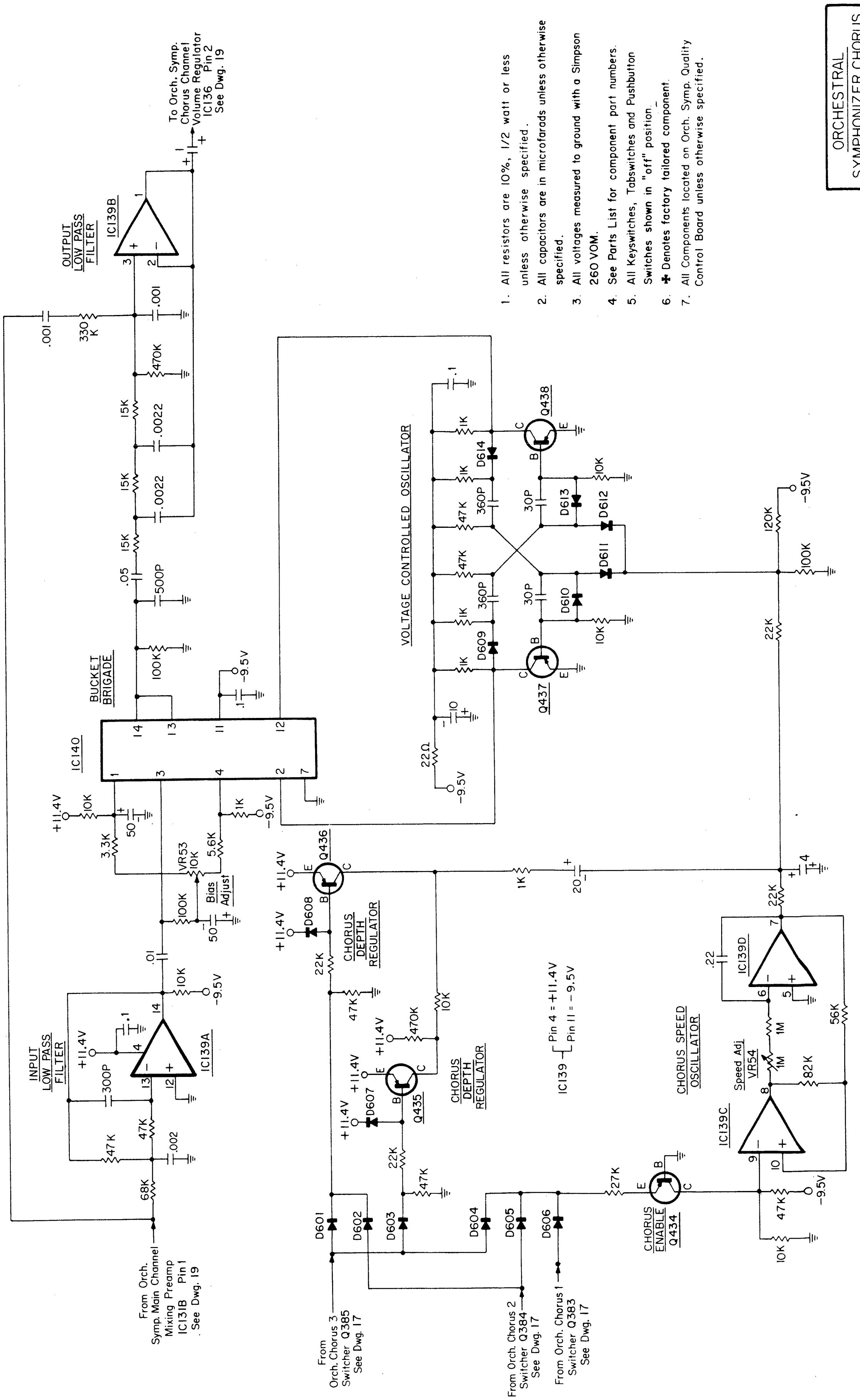
NOTES:

1. All resistors are 10%, 1/2 watt or less unless otherwise specified.
2. All Capacitors are in microfarads unless otherwise specified.
3. All voltages measured to ground with a Simpson 260 VOM.
4. See Parts List for component part numbers.
5. All Keyswitches, Tabswitches and Pushbutton Switches shown in "off" position.
6. ✚ Denotes factory tailored component.
7. All Components located on Orch Symp Q.C. Board unless otherwise specified.
8. Bold line indicates Orch. Symp. Keying Groups, example shown on Dwg. 18.

ORCHESTRAL SYMPHONIZER
QUALITY CONTROL

Dwg. No. 19
Model C300

SCHEMATIC 20



To Orch. Symp. Chorus Channel Volume Regulator IC136 Pin 2 See Dwg. 19
OUTPUT LOW PASS FILTER
IC139B
.001
330 K
470K
15K
.0022
.05
500P
100K
BUCKET BRIGADE
IC140
-9.5V
+11.4V
10K
50
3.3K
VR53 10K
5.6K
1K
Bias Adjust
INPUT LOW PASS FILTER
IC139A
300P
47K
.002
68K
.01
.1
From Orch. Symp. Main Channel Mixing Preamp IC131B Pin 1 See Dwg. 19
VOLTAGE CONTROLLED OSCILLATOR
Q437
Q438
D609
D610
D611
D612
D613
D614
360P
30P
22Ω
120K
22K
Q436
D608
CHORUS DEPTH REGULATOR
Q435
D607
22K
470K
20
4
IC139 Pin 4 = +11.4V Pin 11 = -9.5V
CHORUS SPEED OSCILLATOR
IC139D
IC139C
.22
1M
Speed Adj VR54 1M
82K
56K
27K
CHORUS ENABLE Q434
D601
D602
D603
D604
D605
D606
From Orch. Chorus 3 Switcher Q385 See Dwg. 17
From Orch. Chorus 2 Switcher Q384 See Dwg. 17
From Orch. Chorus 1 Switcher Q383 See Dwg. 17

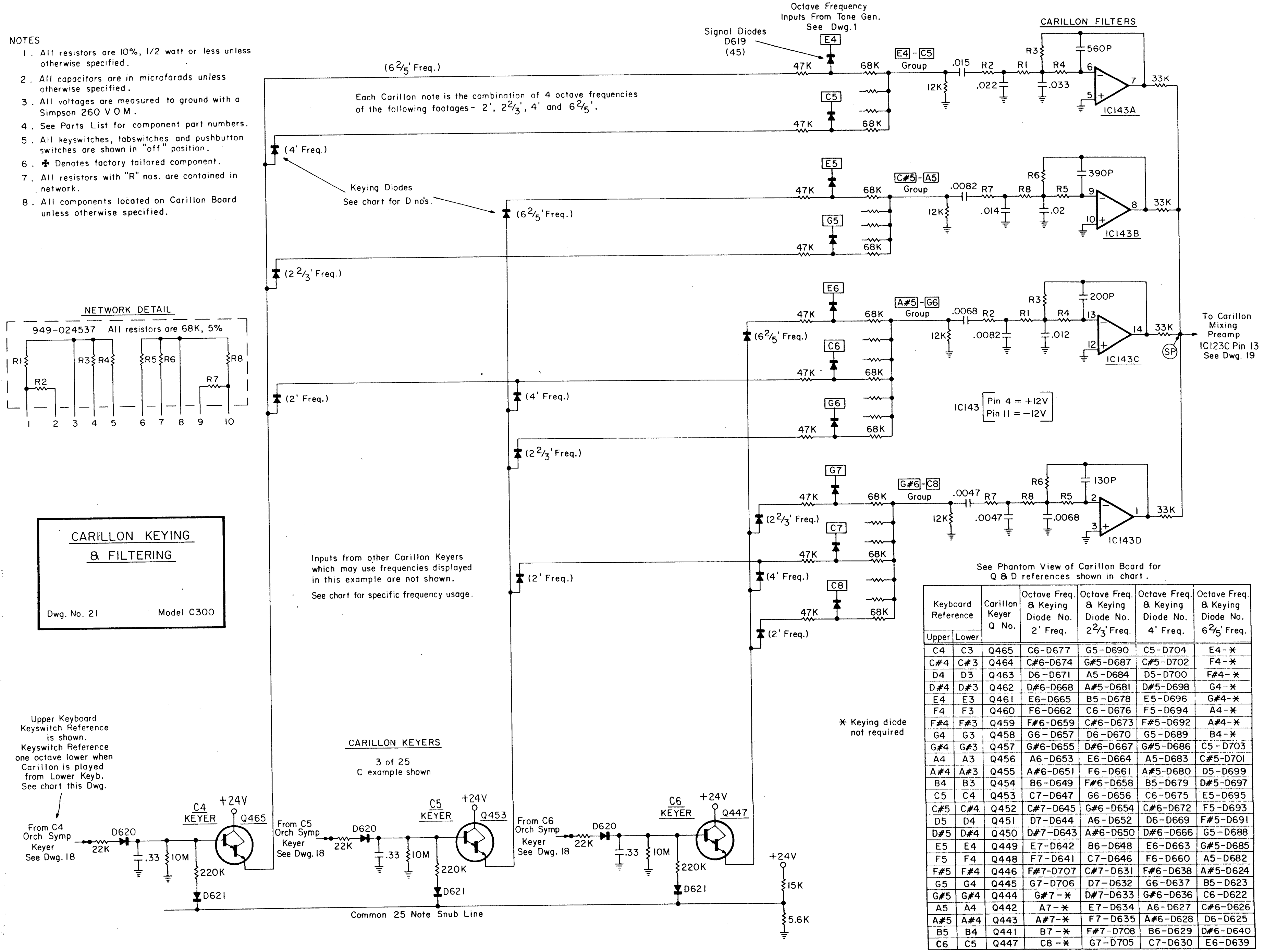
1. All resistors are 10%, 1/2 watt or less unless otherwise specified.
2. All capacitors are in microfarads unless otherwise specified.
3. All voltages measured to ground with a Simpson 260 VOM.
4. See Parts List for component part numbers.
5. All Keyswitches, Tabswitches and Pushbutton Switches shown in "off" position.
6. ✚ Denotes factory tailored component.
7. All Components located on Orch. Symp. Quality Control Board unless otherwise specified.

ORCHESTRAL
SYMPHONIZER CHORUS
Dwg. No. 20 Model C300

SCHEMATIC 21

NOTES

1. All resistors are 10%, 1/2 watt or less unless otherwise specified.
2. All capacitors are in microfarads unless otherwise specified.
3. All voltages are measured to ground with a Simpson 260 V O M.
4. See Parts List for component part numbers.
5. All keyswitches, tabswitches and pushbutton switches are shown in "off" position.
6. ✚ Denotes factory tailored component.
7. All resistors with "R" nos. are contained in network.
8. All components located on Carillon Board unless otherwise specified.


CARILLON FILTERS
Octave Frequency
Inputs From Tone Gen.
See Dwg. 1
Signal Diodes
D619
(45)
E4
C5
E5
G5
E6
C6
G6
G7
C7
C8
E4-C5
Group
C#5-A5
Group
A#5-G6
Group
G#6-C8
Group
47K
68K
12K
.015
R2
.022
R1
R4
.033
R3
560P
IC143A
33K
.0082
R7
.014
R8
R5
.02
R6
390P
IC143B
.0068
.0082
.012
200P
IC143C
.0047
.0047
.0068
130P
IC143D
To Carillon
Mixing
Preamp
IC123C Pin 13
See Dwg. 19
SP
IC143
Pin 4 = +12V
Pin 11 = -12V
(6 2/5' Freq.)
(4' Freq.)
(2 2/3' Freq.)
(2' Freq.)
Each Carillon note is the combination of 4 octave frequencies of the following footages - 2', 2 2/3', 4' and 6 2/5'.
Keying Diodes
See chart for D no's.
Inputs from other Carillon Keyers which may use frequencies displayed in this example are not shown.
See chart for specific frequency usage.
NETWORK DETAIL
949-024537 All resistors are 68K, 5%
R1
R2
R3
R4
R5
R6
R7
R8
1
2
3
4
5
6
7
8
9
10
CARILLON KEYERS
3 of 25
C example shown
Upper Keyboard
Keyswitch Reference
is shown.
Keyswitch Reference
one octave lower when
Carillon is played
from Lower Keyb.
See chart this Dwg.
From C4
Orch Symp
Keyer
See Dwg. 18
From C5
Orch Symp
Keyer
See Dwg. 18
From C6
Orch Symp
Keyer
See Dwg. 18
D620
22K
.33
10M
220K
D621
C4
KEYER
C5
KEYER
C6
KEYER
+24V
Q465
Q453
Q447
15K
5.6K
Common 25 Note Snub Line

CARILLON KEYING
& FILTERING

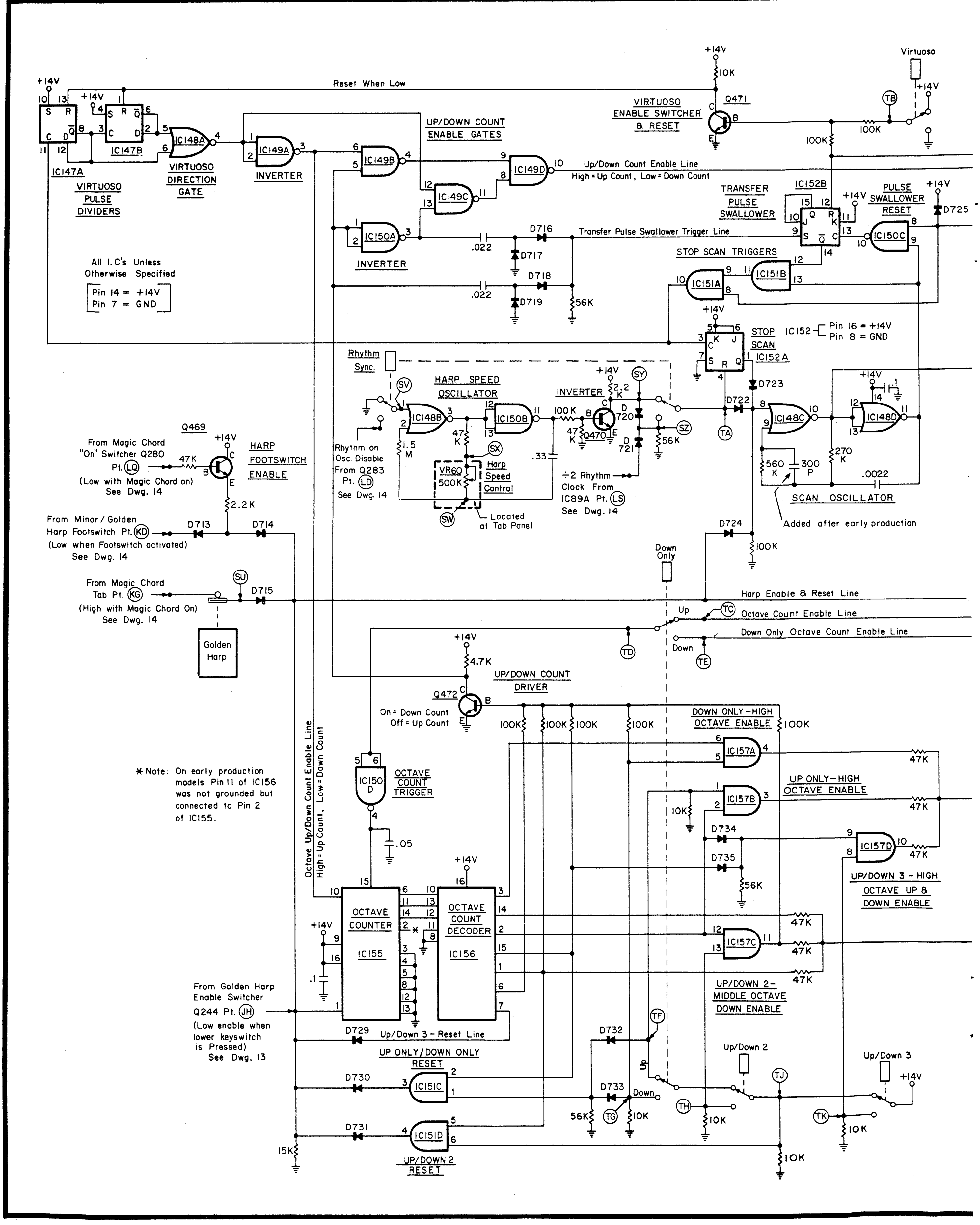
Dwg. No. 21 Model C300

See Phantom View of Carillon Board for Q & D references shown in chart.

Keyboard Reference		Carillon Keyer Q No.	Octave Freq. & Keying Diode No. 2' Freq.	Octave Freq. & Keying Diode No. $2\frac{2}{3}$' Freq.	Octave Freq. & Keying Diode No. 4' Freq.	Octave Freq. & Keying Diode No. $6\frac{2}{5}$' Freq.
Upper	Lower					
C4	C3	Q465	C6-D677	G5-D690	C5-D704	E4-✱
C#4	C#3	Q464	C#6-D674	G#5-D687	C#5-D702	F4-✱
D4	D3	Q463	D6-D671	A5-D684	D5-D700	F#4-✱
D#4	D#3	Q462	D#6-D668	A#5-D681	D#5-D698	G4-✱
E4	E3	Q461	E6-D665	B5-D678	E5-D696	G#4-✱
F4	F3	Q460	F6-D662	C6-D676	F5-D694	A4-✱
F#4	F#3	Q459	F#6-D659	C#6-D673	F#5-D692	A#4-✱
G4	G3	Q458	G6-D657	D6-D670	G5-D689	B4-✱
G#4	G#3	Q457	G#6-D655	D#6-D667	G#5-D686	C5-D703
A4	A3	Q456	A6-D653	E6-D664	A5-D683	C#5-D701
A#4	A#3	Q455	A#6-D651	F6-D661	A#5-D680	D5-D699
B4	B3	Q454	B6-D649	F#6-D658	B5-D679	D#5-D697
C5	C4	Q453	C7-D647	G6-D656	C6-D675	E5-D695
C#5	C#4	Q452	C#7-D645	G#6-D654	C#6-D672	F5-D693
D5	D4	Q451	D7-D644	A6-D652	D6-D669	F#5-D691
D#5	D#4	Q450	D#7-D643	A#6-D650	D#6-D666	G5-D688
E5	E4	Q449	E7-D642	B6-D648	E6-D663	G#5-D685
F5	F4	Q448	F7-D641	C7-D646	F6-D660	A5-D682
F#5	F#4	Q446	F#7-D707	C#7-D631	F#6-D638	A#5-D624
G5	G4	Q445	G7-D706	D7-D632	G6-D637	B5-D623
G#5	G#4	Q444	G#7-✱	D#7-D633	G#6-D636	C6-D622
A5	A4	Q442	A7-✱	E7-D634	A6-D627	C#6-D626
A#5	A#4	Q443	A#7-✱	F7-D635	A#6-D628	D6-D625
B5	B4	Q441	B7-✱	F#7-D708	B6-D629	D#6-D640
C6	C5	Q447	C8-✱	G7-D705	C7-D630	E6-D639

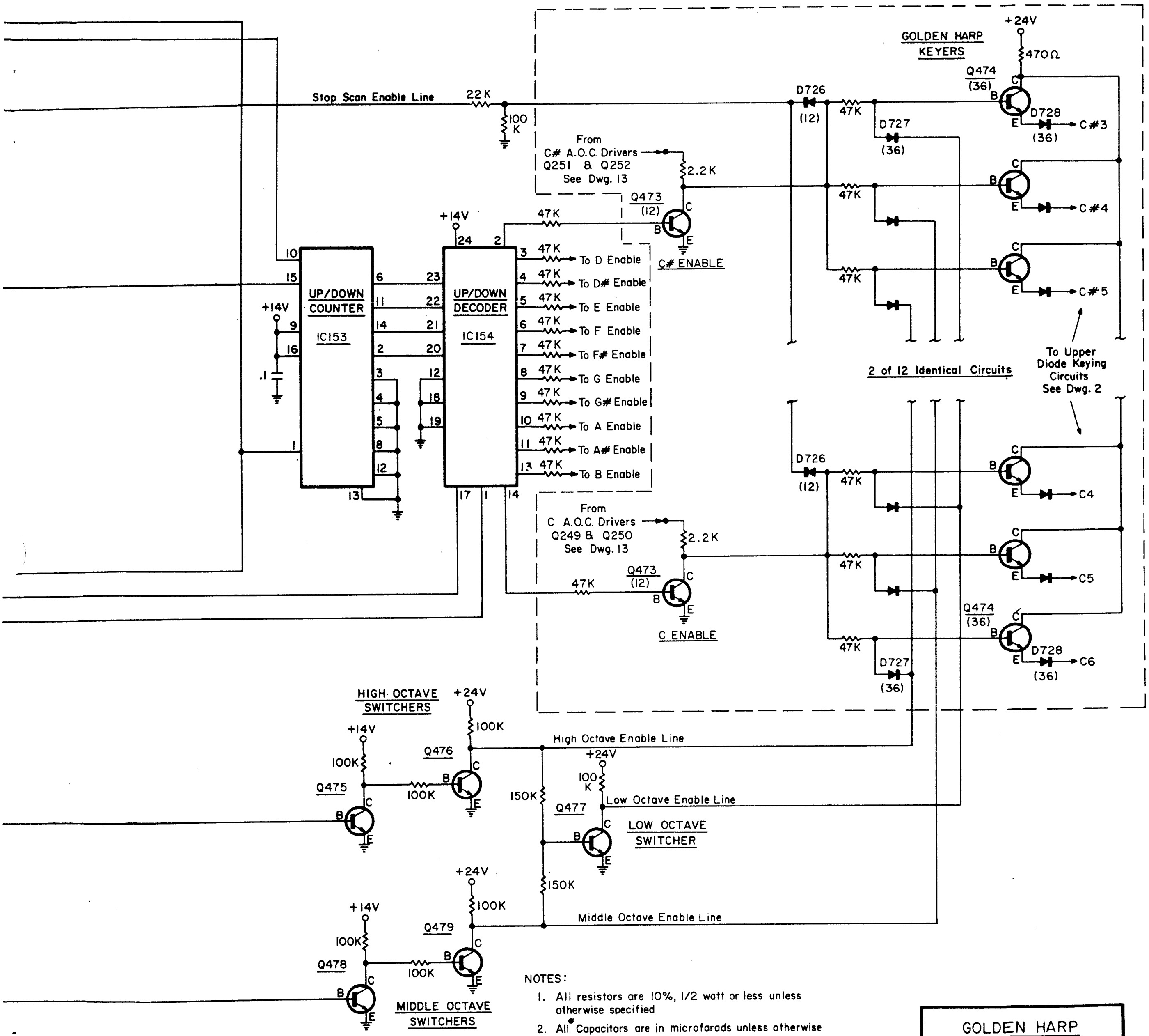
✱ Keying diode not required

SCHEMATIC 22



+14V
Reset When Low
IC147A
IC147B
VIRTUOSO PULSE DIVIDERS
IC148A
VIRTUOSO DIRECTION GATE
IC149A
INVERTER
UP/DOWN COUNT ENABLE GATES
IC149B
IC149C
IC149D
Up/Down Count Enable Line
High = Up Count, Low = Down Count
IC150A
INVERTER
10K
VIRTUOSO ENABLE SWITCHER & RESET
Q471
Virtuoso
TB
100K
TRANSFER PULSE SWALLOWER
IC152B
PULSE SWALLOWER RESET
IC150C
D725
D716
D717
D718
D719
.022
56K
Transfer Pulse Swallower Trigger Line
STOP SCAN TRIGGERS
IC151A
IC151B
All I.C's Unless Otherwise Specified
Pin 14 = +14V
Pin 7 = GND
STOP SCAN IC152A
IC152 Pin 16 = +14V
Pin 8 = GND
Rhythm Sync.
SV
HARP SPEED OSCILLATOR
IC148B
IC150B
INVERTER
SY
Q470
D720
D721
2.2K
SX
SZ
Rhythm on Osc. Disable From Q283 Pt. LD See Dwg. 14
1.5 M
47K
VR60 500K
Harp Speed Control
SW
Located at Tab Panel
.33
÷2 Rhythm Clock From IC89A Pt. LS See Dwg. 14
D722
D723
TA
IC148C
IC148D
560 K
300 P
270 K
.0022
.1
SCAN OSCILLATOR
Added after early production
Q469
From Magic Chord "On" Switcher Q280 Pt. LQ
(Low with Magic Chord on) See Dwg. 14
HARP FOOTSWITCH ENABLE
2.2K
From Minor / Golden Harp Footswitch Pt. KD
(Low when Footswitch activated) See Dwg. 14
D713
D714
D724
100K
Down Only
From Magic Chord Tab Pt. KG
(High with Magic Chord On) See Dwg. 14
SU
D715
Golden Harp
Harp Enable & Reset Line
Up
TC
Octave Count Enable Line
Down Only Octave Count Enable Line
TD
Down
TE
4.7K
UP/DOWN COUNT DRIVER
Q472
On = Down Count
Off = Up Count
DOWN ONLY-HIGH OCTAVE ENABLE
IC157A
47K
UP ONLY-HIGH OCTAVE ENABLE
IC157B
10K
D734
D735
IC157D
UP/DOWN 3 - HIGH OCTAVE UP & DOWN ENABLE
Octave Up/Down Count Enable Line
High = Up Count, Low = Down Count
IC150 D
OCTAVE COUNT TRIGGER
.05
✱Note: On early production models Pin 11 of IC156 was not grounded but connected to Pin 2 of IC155.
OCTAVE COUNTER IC155
OCTAVE COUNT DECODER IC156
IC157C
UP/DOWN 2-MIDDLE OCTAVE DOWN ENABLE
From Golden Harp Enable Switcher Q244 Pt. JH
(Low enable when lower keyswitch is Pressed) See Dwg. 13
D729
Up/Down 3 - Reset Line
UP ONLY/DOWN ONLY RESET
D730
IC151C
D731
IC151D
UP/DOWN 2 RESET
15K
TF
D732
D733
TG
TH
Up/Down 2
TJ
Up/Down 3
TK

SCHEMATIC 22


GOLDEN HARP KEYERS
+24V
470Ω
Q474 (36)
D726 (12)
D727 (36)
D728 (36)
Stop Scan Enable Line
22 K
100 K
47K
C#3
C#4
C#5
From C# A.O.C. Drivers Q251 & Q252 See Dwg. 13
2.2 K
Q473 (12)
C# ENABLE
+14V
UP/DOWN COUNTER IC153
UP/DOWN DECODER IC154
.1
To D Enable
To D# Enable
To E Enable
To F Enable
To F# Enable
To G Enable
To G# Enable
To A Enable
To A# Enable
To B Enable
2 of 12 Identical Circuits
To Upper Diode Keying Circuits See Dwg. 2
C4
C5
C6
From C A.O.C. Drivers Q249 & Q250 See Dwg. 13
C ENABLE
HIGH OCTAVE SWITCHERS
Q475
Q476
100K
High Octave Enable Line
150K
Q477
Low Octave Enable Line
LOW OCTAVE SWITCHER
Middle Octave Enable Line
Q478
Q479
MIDDLE OCTAVE SWITCHERS

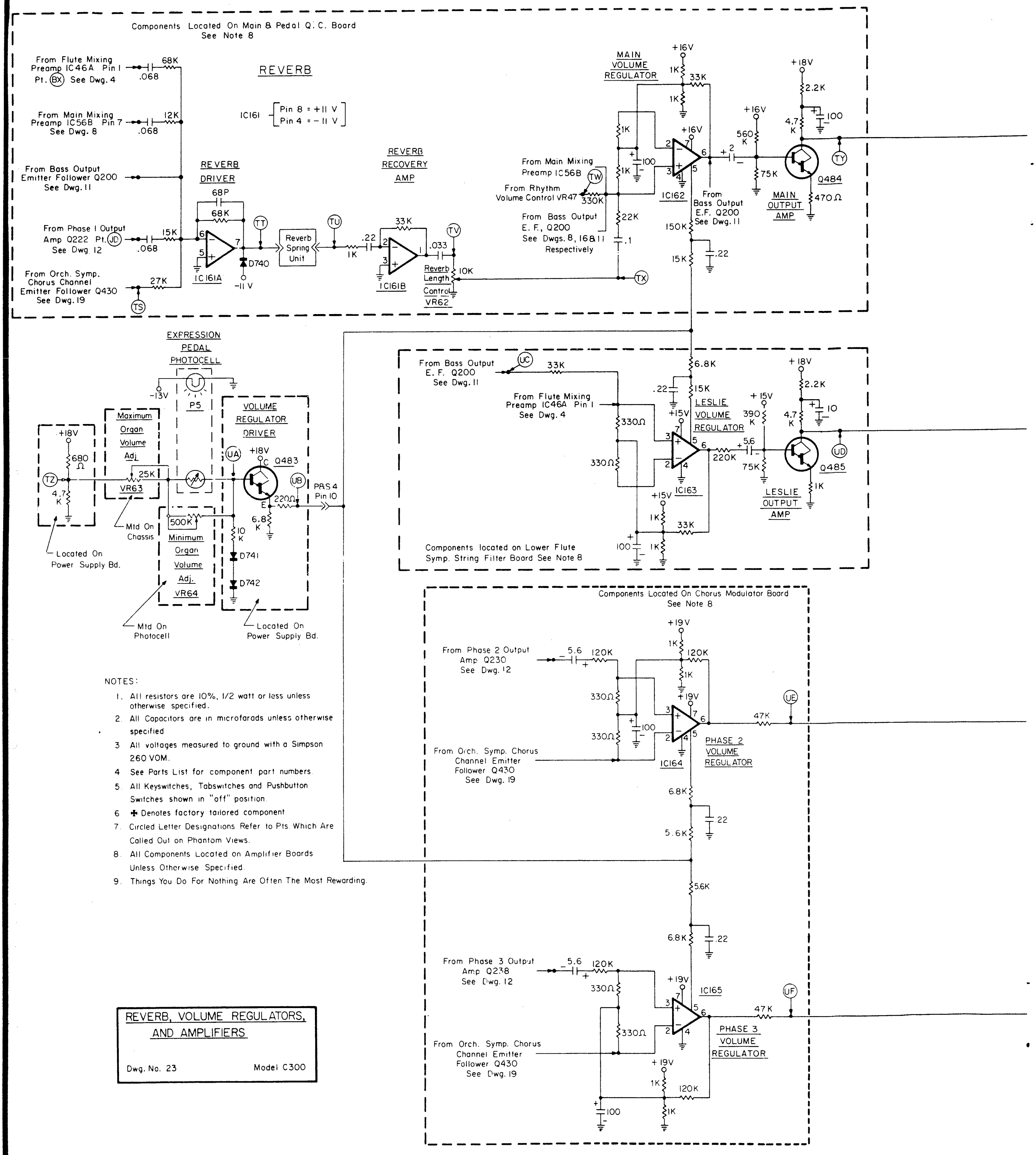
NOTES:

1. All resistors are 10%, 1/2 watt or less unless otherwise specified
2. All Capacitors are in microfarads unless otherwise specified.
3. All voltages measured to ground with a Simpson 260 VOM.
4. See Parts List for component part numbers.
5. All Keyswitches, Tabswitches and Pushbutton Switches shown in "off" position.
6. ✚ Denotes factory tailored component.
7. All components located on Golden Harp board unless otherwise specified.

GOLDEN HARP

Dwg. No. 22 Model C300

SCHEMATIC 23


Components Located On Main & Pedal Q. C. Board
See Note 8
REVERB
IC161 [Pin 8 = +11 V, Pin 4 = −11 V]
From Flute Mixing Preamp IC46A Pin 1 Pt. BX See Dwg. 4
68K
.068
From Main Mixing Preamp IC56B Pin 7 See Dwg. 8
12K
.068
From Bass Output Emitter Follower Q200 See Dwg. 11
From Phase 1 Output Amp Q222 Pt. JD See Dwg 12
15K
.068
From Orch. Symp. Chorus Channel Emitter Follower Q430 See Dwg. 19
27K
TS
REVERB DRIVER
68P
68K
IC161A
D740
−11 V
TT
Reverb Spring Unit
TU
1K
.22
33K
REVERB RECOVERY AMP
IC161B
.033
TV
Reverb Length Control VR62
10K
TX
MAIN VOLUME REGULATOR
+16V
1K
33K
1K
1K
100
1K
From Main Mixing Preamp IC56B
TW
From Rhythm Volume Control VR47
330K
From Bass Output E. F., Q200 See Dwgs. 8, 16 & 11 Respectively
22K
.1
IC162
From Bass Output E.F. Q200 See Dwg. 11
150K
.22
15K
2
560 K
75K
+18V
2.2K
4.7 K
100
Q484
MAIN OUTPUT AMP
470Ω
TY
EXPRESSION PEDAL PHOTOCELL
−13V
P5
Maximum Organ Volume Adj.
25K
VR63
Mtd On Chassis
+18V
680 Ω
TZ
4.7 K
Located On Power Supply Bd.
500K
Minimum Organ Volume Adj. VR64
Mtd On Photocell
VOLUME REGULATOR DRIVER
UA
+18V
C
Q483
UB
E
220Ω
6.8 K
10 K
D741
D742
P&S 4 Pin 10
Located On Power Supply Bd.
From Bass Output E. F. Q200 See Dwg. 11
UC
33K
From Flute Mixing Preamp IC46A Pin 1 See Dwg. 4
330Ω
330Ω
6.8K
.22
15K
+15V
LESLIE VOLUME REGULATOR
IC163
220K
5.6
+15V
390 K
75K
1K
33K
100
1K
+18V
2.2K
4.7 K
10
UD
Q485
1K
LESLIE OUTPUT AMP
Components located on Lower Flute Symp. String Filter Board See Note 8
Components Located On Chorus Modulator Board
See Note 8
+19V
1K
120K
1K
From Phase 2 Output Amp Q230 See Dwg. 12
5.6
120K
330Ω
100
330Ω
From Orch. Symp. Chorus Channel Emitter Follower Q430 See Dwg. 19
IC164
47K
UE
PHASE 2 VOLUME REGULATOR
6.8K
.22
5.6K
5.6K
6.8K
.22
From Phase 3 Output Amp Q238 See Dwg. 12
5.6
120K
330Ω
330Ω
+19V
IC165
47K
UF
PHASE 3 VOLUME REGULATOR
From Orch. Symp. Chorus Channel Emitter Follower Q430 See Dwg. 19
+19V
1K
120K
100
1K

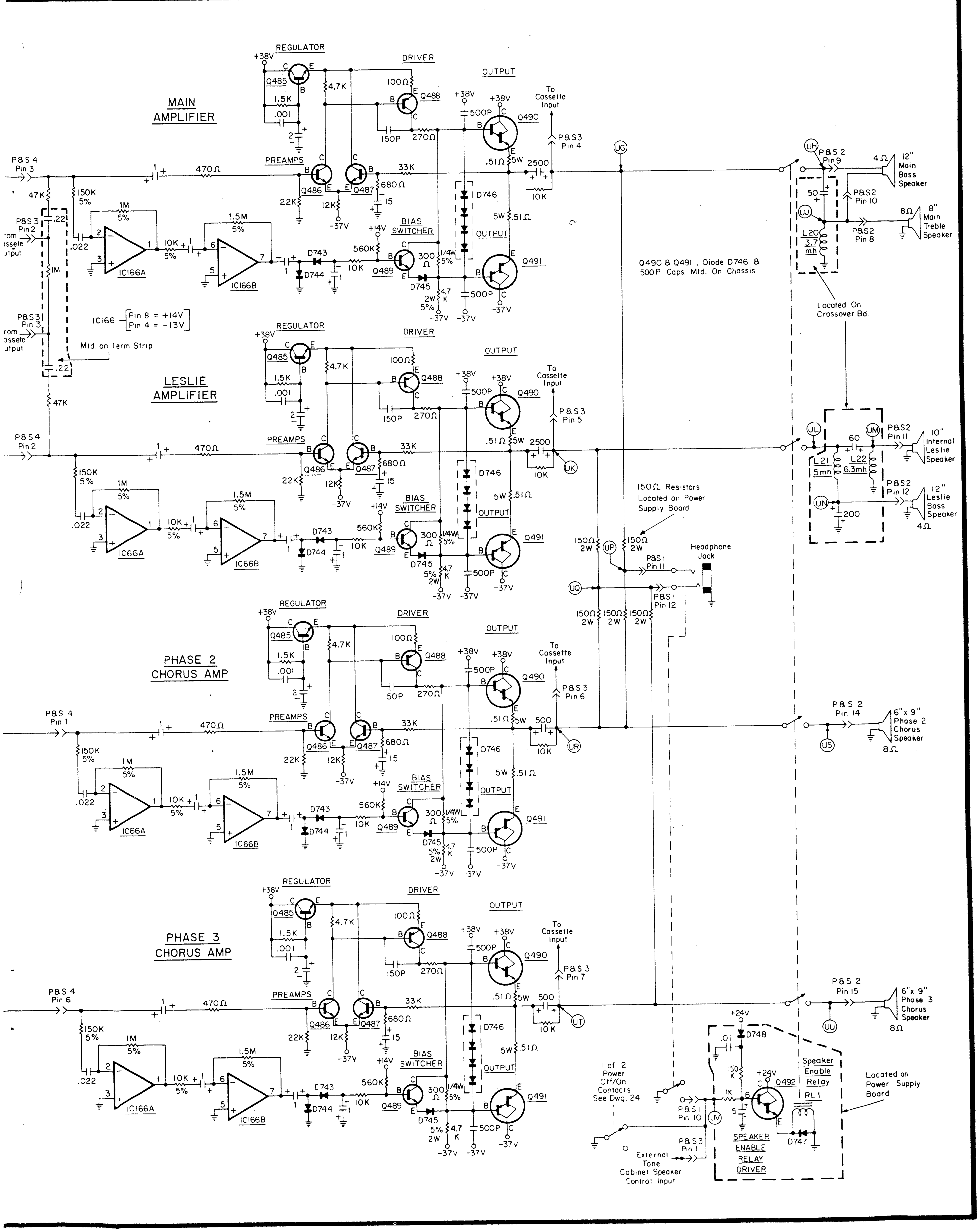
NOTES:

1. All resistors are 10%, 1/2 watt or less unless otherwise specified.
2. All Capacitors are in microfarads unless otherwise specified
3. All voltages measured to ground with a Simpson 260 VOM.
4. See Parts List for component part numbers.
5. All Keyswitches, Tabswitches and Pushbutton Switches shown in "off" position.
6. ✚ Denotes factory tailored component
7. Circled Letter Designations Refer to Pts. Which Are Called Out on Phantom Views.
8. All Components Located on Amplifier Boards Unless Otherwise Specified.
9. Things You Do For Nothing Are Often The Most Rewarding.

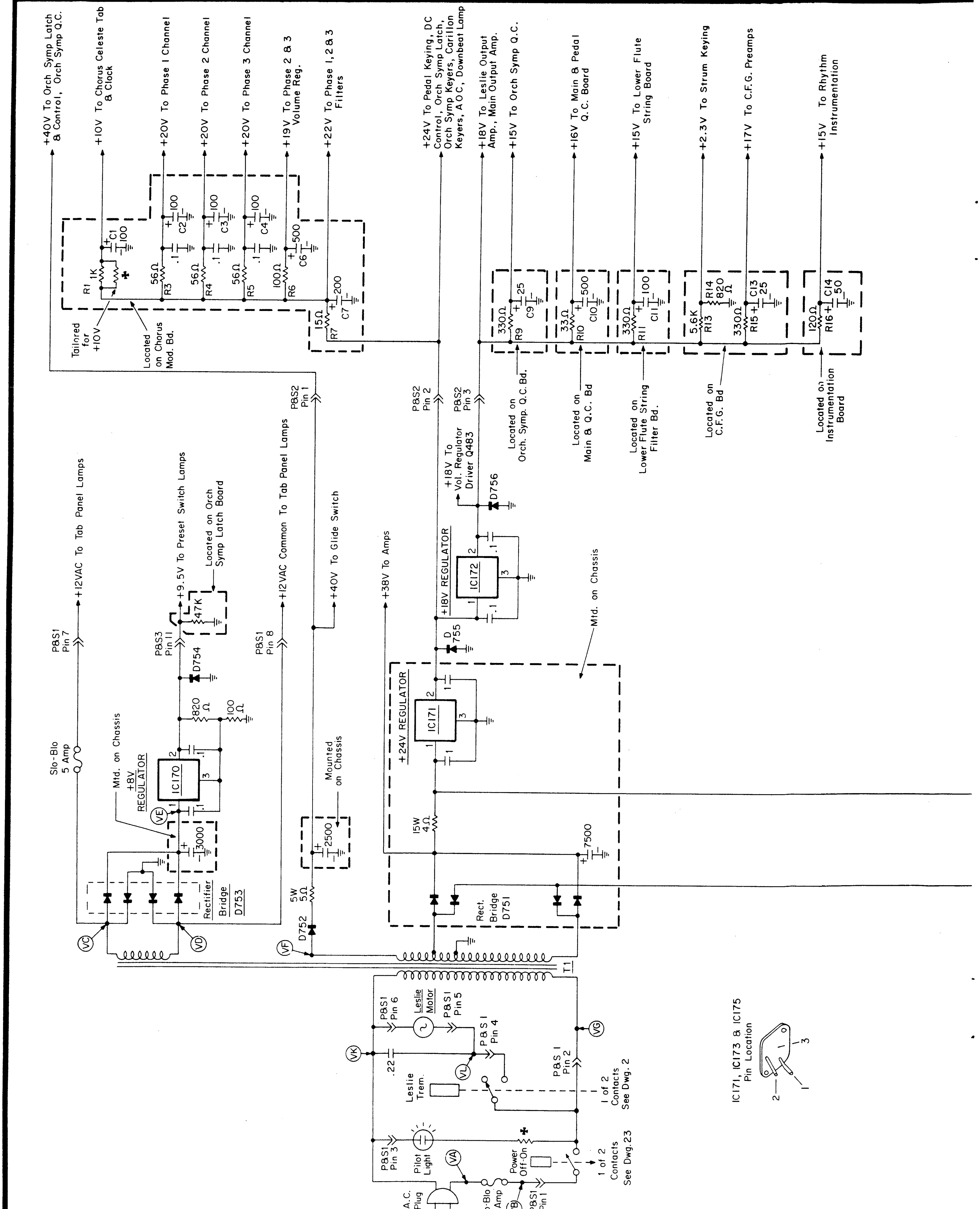
REVERB, VOLUME REGULATORS,
AND AMPLIFIERS

Dwg. No. 23 Model C300

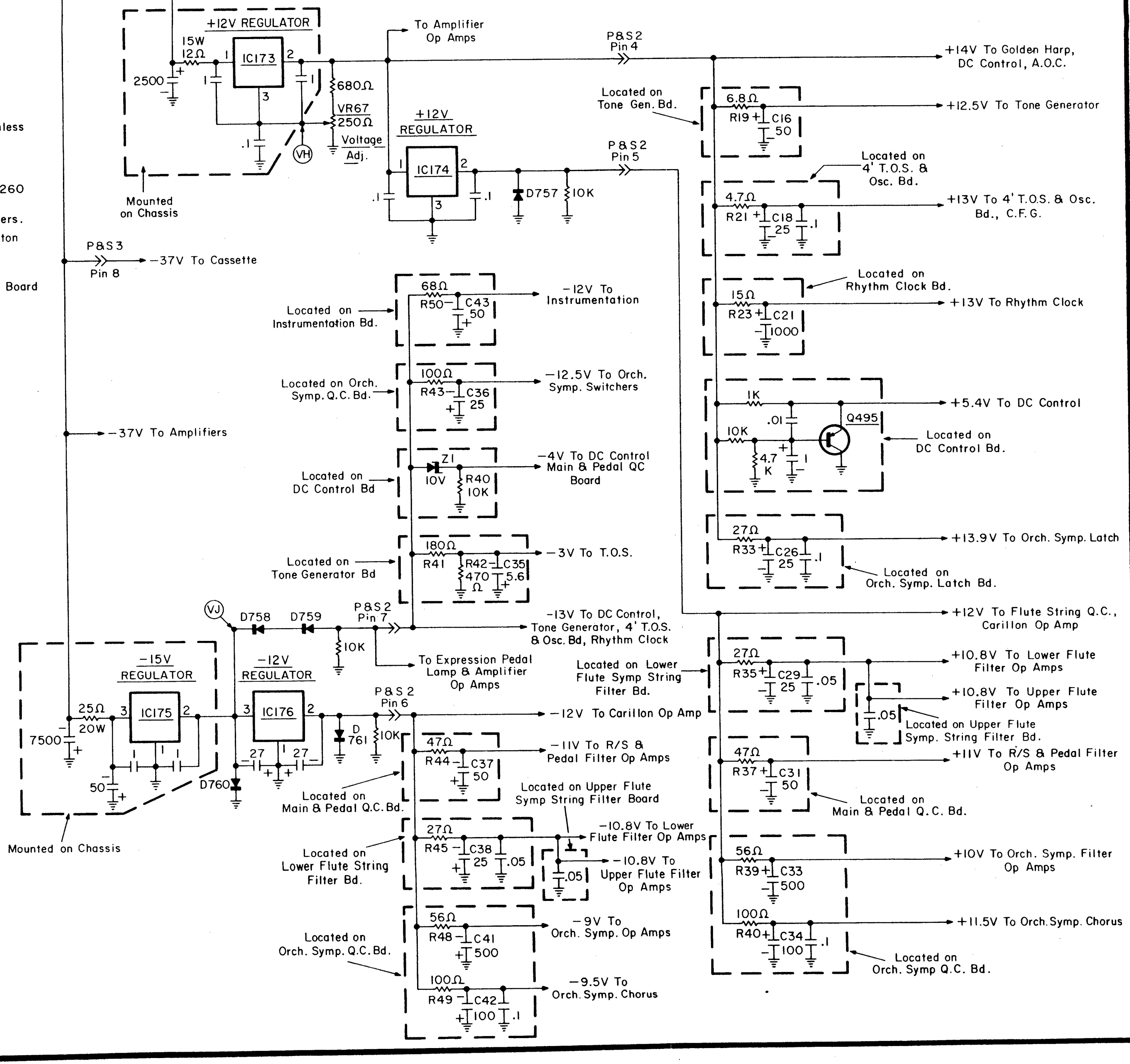
SCHEMATIC 23


MAIN AMPLIFIER
LESLIE AMPLIFIER
PHASE 2 CHORUS AMP
PHASE 3 CHORUS AMP
REGULATOR
DRIVER
OUTPUT
PREAMPS
BIAS SWITCHER
+38V
-37V
+14V
Q485
Q486
Q487
Q488
Q489
Q490
Q491
IC166A
IC166B
IC66A
IC66B
D743
D744
D745
D746
1.5K
.001
4.7K
100Ω
500P
150P
270Ω
33K
680Ω
22K
12K
470Ω
150K 5%
1M 5%
1.5M 5%
10K 5%
.022
560K
300 Ω
1/4W 5%
4.7 K 5% 2W
.51Ω 5W
2500
500
10K
To Cassette Input
P&S 3 Pin 4
P&S 3 Pin 5
P&S 3 Pin 6
P&S 3 Pin 7
P&S 4 Pin 3
P&S 4 Pin 2
P&S 4 Pin 1
P&S 4 Pin 6
47K
P&S 3 Pin 2
P&S 3 Pin 3
.22
rom assete utput
IC166 Pin 8 = +14V Pin 4 = -13V
Mtd. on Term Strip
Q490 & Q491, Diode D746 & 500P Caps. Mtd. On Chassis
UG
UH
UJ
UK
UL
UM
UN
UP
UQ
UR
US
UT
UU
UV
P&S 2 Pin 9
4Ω 12" Main Bass Speaker
50
P&S2 Pin 10
8Ω 8" Main Treble Speaker
P&S2 Pin 8
L20 3.7 mh
Located On Crossover Bd
60
L21 5mh
L22 6.3mh
P&S2 Pin 11
10" Internal Leslie Speaker
P&S2 Pin 12
12" Leslie Bass Speaker 4Ω
200
150Ω Resistors Located on Power Supply Board
150Ω 2W
P&S 1 Pin 11
P&S 1 Pin 12
Headphone Jack
P&S 2 Pin 14
6"x 9" Phase 2 Chorus Speaker 8Ω
P&S 2 Pin 15
6"x 9" Phase 3 Chorus Speaker 8Ω
+24V
.01
D748
150 K
1K
15
Q492
Speaker Enable Relay RL1
D747
SPEAKER ENABLE RELAY DRIVER
Located on Power Supply Board
1 of 2 Power Off/On Contacts See Dwg. 24
P&S 1 Pin 10
P&S 3 Pin 1
External Tone Cabinet Speaker Control Input

SCHEMATIC 24


+40V To Orch Symp Latch & Control, Orch Symp Q.C.
+10V To Chorus Celeste Tab & Clock
+20V To Phase 1 Channel
+20V To Phase 2 Channel
+20V To Phase 3 Channel
+19V To Phase 2 & 3 Volume Reg.
+22V To Phase 1, 2 & 3 Filters
+24V To Pedal Keying, DC Control, Orch Symp Latch, Orch Symp Keyers, Carillon Keyers, AOC, Downbeat Lamp
+18V To Leslie Output Amp., Main Output Amp.
+15V To Orch Symp Q.C.
+16V To Main & Pedal Q.C. Board
+15V To Lower Flute String Board
+2.3V To Strum Keying
+17V To C.F.G. Preamps
+15V To Rhythm Instrumentation
C1 100
C2 100
C3 100
C4 100
C6 500
C7 200
R1 1K
*
R3 56Ω
R4 56Ω
R5 56Ω
R6 100Ω
R7 15Ω
.1
Tailored for +10V
Located on Chorus Mod. Bd.
R9 330Ω
C9 25
R10 33Ω
C10 500
R11 330Ω
C11 100
R13 5.6K
R14 820 Ω
R15 330Ω
C13 25
R16 120Ω
C14 50
Located on Orch. Symp. Q.C. Bd.
Located on Main & Q.C. Bd
Located on Lower Flute String Filter Bd.
Located on C.F.G. Bd
Located on Instrumentation Board
P&S2 Pin 1
P&S2 Pin 2
P&S2 Pin 3
+18V To Vol. Regulator Driver Q483
D756
+18V REGULATOR
IC172
1 2 3
.1
+12VAC To Tab Panel Lamps
P&S1 Pin 7
+9.5V To Preset Switch Lamps
Located on Orch Symp Latch Board
47K
P&S3 Pin 11
D754
820 Ω
100 Ω
+12VAC Common To Tab Panel Lamps
P&S1 Pin 8
+40V To Glide Switch
+38V To Amps
D 755
Mtd. on Chassis
+24V REGULATOR
IC171
Slo-Blo 5 Amp
Mtd. on Chassis
+8V REGULATOR
IC170
VE
3000
Mounted on Chassis
2500
15W 4Ω
7500
5W 5Ω
D752
Rectifier Bridge D753
Rect. Bridge D751
VC
VD
VF
T1
P&S1 Pin 6
Leslie Motor
P&S1 Pin 5
P&S1 Pin 4
VK
.22
VL
Leslie Trem.
P&S1 Pin 2
VG
1 of 2 Contacts See Dwg. 2
P&S1 Pin 3
Pilot Light
VA
*
Power Off-On
1 of 2 Contacts See Dwg. 23
A.C. Plug
Slo-Blo 5 Amp
VB
P&S1 Pin 1
IC171, IC173 & IC175 Pin Location
1
2
3

SCHEMATIC 24


+12V REGULATOR
IC173
15W
12Ω
2500
680Ω
VR67
250Ω
Voltage Adj.
VH
Mounted on Chassis
To Amplifier Op Amps
+12V REGULATOR
IC174
D757
10K
P&S2 Pin 4
P&S2 Pin 5
+14V To Golden Harp, DC Control, A.O.C.
Located on Tone Gen. Bd.
6.8Ω
R19
C16
50
+12.5V To Tone Generator
Located on 4' T.O.S. & Osc. Bd.
4.7Ω
R21
C18
25
+13V To 4' T.O.S. & Osc. Bd., C.F.G.
Located on Rhythm Clock Bd.
15Ω
R23
C21
1000
+13V To Rhythm Clock
1K
10K
.01
4.7 K
Q495
+5.4V To DC Control
Located on DC Control Bd.
27Ω
R33
C26
+13.9V To Orch. Symp. Latch
Located on Orch. Symp. Latch Bd.
+12V To Flute String Q.C., Carillon Op Amp
Located on Lower Flute Symp String Filter Bd.
27Ω
R35
C29
.05
+10.8V To Lower Flute Filter Op Amps
+10.8V To Upper Flute Filter Op Amps
Located on Upper Flute Symp. String Filter Bd.
47Ω
R37
C31
+11V To R/S & Pedal Filter Op Amps
Located on Main & Pedal Q.C. Bd.
56Ω
R39
C33
500
+10V To Orch. Symp. Filter Op Amps
100Ω
R40
C34
100
+11.5V To Orch.Symp. Chorus
Located on Orch. Symp Q.C. Bd.
P&S3 Pin 8
-37V To Cassette
-37V To Amplifiers
Located on Instrumentation Bd.
68Ω
R50
C43
-12V To Instrumentation
Located on Orch. Symp. Q.C. Bd.
100Ω
R43
C36
-12.5V To Orch. Symp. Switchers
Located on DC Control Bd
Z1
10V
R40
10K
-4V To DC Control Main & Pedal QC Board
Located on Tone Generator Bd
180Ω
R41
R42
470 Ω
C35
5.6
-3V To T.O.S.
VJ
D758
D759
P&S2 Pin 7
-13V To DC Control, Tone Generator, 4' T.O.S. & Osc. Bd, Rhythm Clock
To Expression Pedal Lamp & Amplifier Op Amps
-15V REGULATOR
IC175
25Ω
20W
7500
Mounted on Chassis
-12V REGULATOR
IC176
27
D760
D 761
P&S2 Pin 6
-12V To Carillon Op Amp
Located on Main & Pedal Q.C. Bd.
47Ω
R44
C37
-11V To R/S & Pedal Filter Op Amps
Located on Upper Flute Symp String Filter Board
Located on Lower Flute String Filter Bd.
27Ω
R45
C38
-10.8V To Lower Flute Filter Op Amps
-10.8V To Upper Flute Filter Op Amps
Located on Orch. Symp. Q.C. Bd.
56Ω
R48
C41
-9V To Orch. Symp. Op Amps
100Ω
R49
C42
-9.5V To Orch. Symp. Chorus

NOTES

1. All resistors are 10%, 1/2 watt or less unless otherwise specified.
2. All capacitors are in microfarads unless otherwise specified.
3. All measured to ground with a Simpson 260 VOM.
4. See Parts List for component part numbers.
5. All keyswitches, tabswitches and pushbutton switches shown in "off" position.
6. ✚ Denotes factory tailored component.
7. All components located on Power Supply Board unless otherwise specified.

POWER SUPPLY

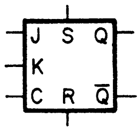
Dwg. No. 24 Model C300

TRUTH TABLES

	LOWREY PART NO.	MFG PART NO.	MFG	FIG
	991-025225	(MM)74C74	NATIONAL	2
	991-026005	(MM)74C86	NATIONAL	13
	991-025536	(MM)74C02	NATIONAL	12
	991-025516	(CD)4071	RCA	11
	991-025517	(CD)4081	RCA	9
	991-025515	(CD)4011	RCA	10
	991-024593	(MM)74C00	NATIONAL	10
	991-026006	(MC)14520	MOTOROLA	3
	991-026025	(CD)4001	RCA	12
	991-026022	(CD)4027	RCA	1
	991-026023	(CD)4028	RCA	7
	991-024595	(MM)74C154	NATIONAL	14
	991-025599	(MC)14532	MOTOROLA	8
*	991-026616	(CD)4514	RCA	4
*	991-026605	(CD)4023	RCA	6
*	991-026606	(CD)4075	RCA	5
*	991-026604	(MC)74C08	NATIONAL	9

* *These parts not used in C300.*

FIG. 1

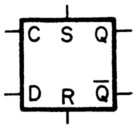


J-K FLIP-FLOP

T_n					T_{n+1}	
J	K	S	R	Clk	Q	$\overline{Q}$
1	0	0	0	↑	1	0
0	1	0	0	↑	0	1
0	0	0	0	↑	Q_n	$\overline{Q}_n$
1	1	0	0	↑	$\overline{Q}_n$	Q_n
X	X	0	1	X	0	1
X	X	1	0	X	1	0
X	X	1	1	X	1	1

X = Don't Care

FIG. 2



D FLIP-FLOP

T_n				T_{n+1}
D	S	R	Clk	Q
1	1	1	↑	1
0	1	1	↑	0
X	0	1	X	1
X	1	0	X	0
–	0	0	–	NOT DEF.

X = Don't Care

FIG. 3

CLOCK	ENABLE	RESET	ACTION
↑	1	0	Counter
0	↓	0	Counter
↑	0	0	No Change
1	↓	0	No Change
X	X	1	Q1–Q4 = 0

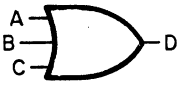
X = Don't Care

FIG. 4

	INH.	INPUT				OUTPUT															
Pin Nos.→	23	22	21	3	2	11	9	10	8	7	6	5	4	18	17	20	19	14	13	16	15
	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	0	0	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	0	0	1	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	0	1	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	1	X	X	X	X	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

X = Don't Care

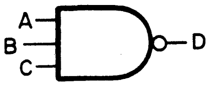
FIG. 5



TRIPLE-INPUT OR

A	B	C	D
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	1

FIG. 6



TRIPLE-INPUT NAND

A	B	C	D
0	0	0	1
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	0

TRUTH TABLES

FIG. 7

Pin Nos.→

INPUT				OUTPUT									
11	12	13	10	3	14	2	15	1	6	7	4	9	5
0	0	0	0	1	0	0	0	0	0	0	0	0	0
0	0	0	1	0	1	0	0	0	0	0	0	0	0
0	0	1	0	0	0	1	0	0	0	0	0	0	0
0	0	1	1	0	0	0	1	0	0	0	0	0	0
0	1	0	0	0	0	0	0	1	0	0	0	0	0
0	1	0	1	0	0	0	0	0	1	0	0	0	0
0	1	1	0	0	0	0	0	0	0	1	0	0	0
0	1	1	1	0	0	0	0	0	0	0	1	0	0
1	0	0	0	0	0	0	0	0	0	0	0	1	0
1	0	0	1	0	0	0	0	0	0	0	0	0	1

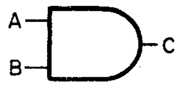
FIG. 8

Pin Nos.→

INPUT									OUTPUT				
5	4	3	2	1	13	12	11	10	14	6	7	9	15
0	X	X	X	X	X	X	X	X	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	1
1	1	X	X	X	X	X	X	X	1	1	1	1	0
1	0	1	X	X	X	X	X	X	1	1	1	0	0
1	0	0	1	X	X	X	X	X	1	1	0	1	0
1	0	0	0	1	X	X	X	X	1	1	0	0	0
1	0	0	0	0	1	X	X	X	1	0	1	1	0
1	0	0	0	0	0	1	X	X	1	0	1	0	0
1	0	0	0	0	0	0	1	X	1	0	0	1	0
1	0	0	0	0	0	0	0	1	1	0	0	0	0

X = Don't Care

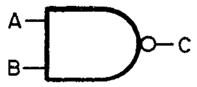
FIG. 9



AND

A	B	C
0	0	0
0	1	0
1	0	0
1	1	1

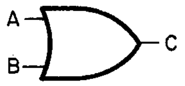
FIG. 10



NAND

A	B	C
0	0	1
0	1	1
1	0	1
1	1	0

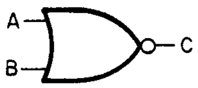
FIG. 11



OR

A	B	C
0	0	0
0	1	1
1	0	1
1	1	1

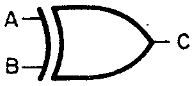
FIG. 12



NOR

A	B	C
0	0	1
0	1	0
1	0	0
1	1	0

FIG. 13



EXCLUSIVE OR

A	B	C
0	0	0
0	1	1
1	0	1
1	1	0

FIG. 14

Pin Nos.→

CONT.		INPUT				OUTPUT															
18	19	20	21	22	23	1	2	3	4	5	6	7	8	9	10	11	13	14	15	16	17
0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
0	0	0	0	1	0	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1
0	0	0	0	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1
0	0	0	1	0	0	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1
0	0	0	1	0	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1
0	0	0	1	1	0	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1
0	0	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1
0	0	1	0	0	0	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1
0	0	1	0	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1
0	0	1	0	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1
0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1
0	0	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1
0	0	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1
0	0	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1
0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
0	1	X	X	X	X	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	0	X	X	X	X	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	X	X	X	X	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

X = Don't Care

TRANSISTOR BASING DIAGRAM

FIG. A

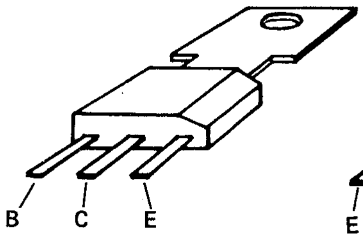


FIG. B

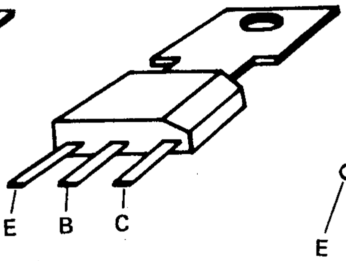


FIG. C

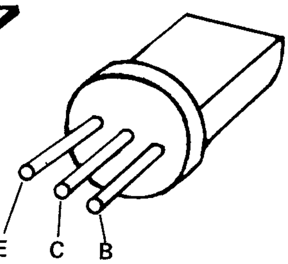


FIG. D

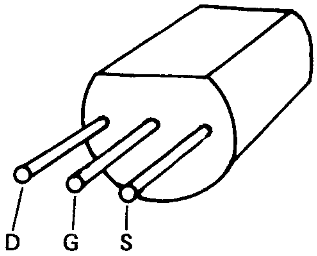


FIG. E

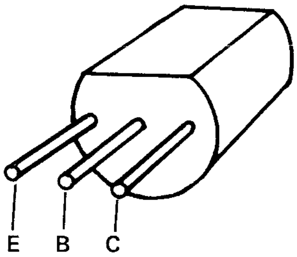


FIG. F

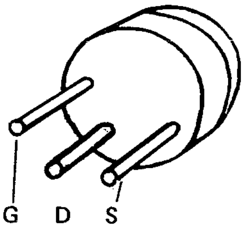


FIG. G

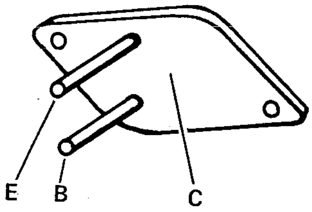


FIG. H

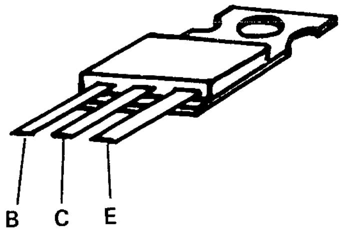


FIG. J

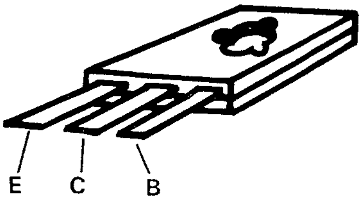


FIG. K

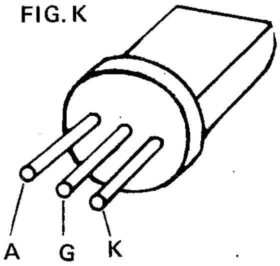


FIG. L

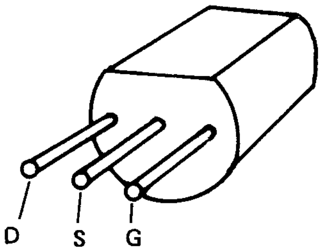
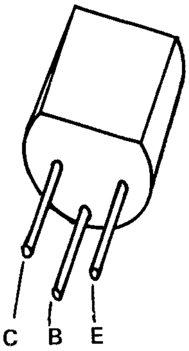


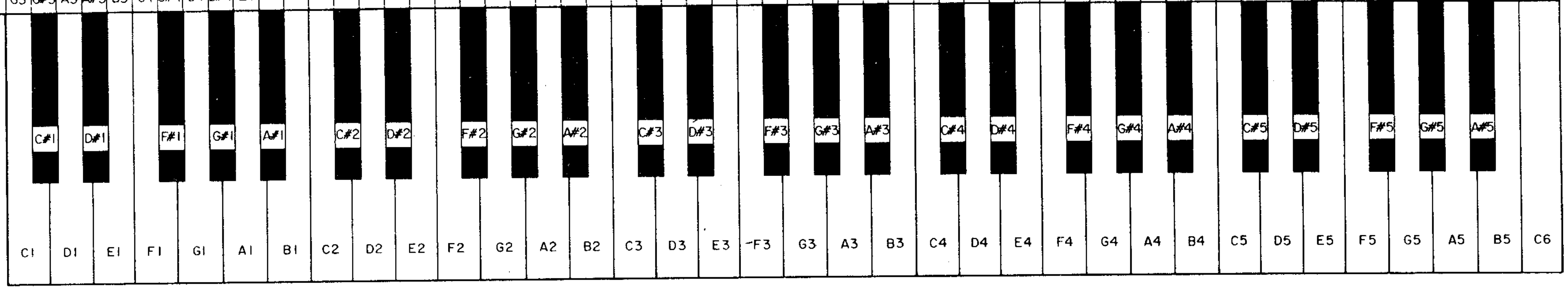
FIG. M



PART NUMBER	FIGURE	PART NUMBER	FIGURE	PART NUMBER	FIGURE	PART NUMBER	FIGURE
992-001192	G	991-012328	F	991-016727	C	992-024185	G
991-002232	C	991-012396	F	991-016788	C	991-024184	C
991-002271	G	991-012686	F	992-017169	G	991-025535	E or M
991-002298	C	992-013170	A	991-017456	F	991-026039	G
991-002356	C	991-013543	C	991-018238	C	991-026040	G
991-002873	C	991-013544	C	991-018047	E	991-026028	G
991-002888	C	991-013599	C	991-018237	B	991-026054	C
992-003139	G	991-015000	A	991-018493	E	991-026617	C
991-003304	C	991-015001	A	992-020432	G	991-026315	C
991-008393	C	991-015062	A	991-020425	H		
991-008394	C	991-015063	A	991-020426	H		
992-008890	G	991-015316	K	992-022201	G		
991-010098	C	991-015587	C	991-021451	J		
991-010462	C	991-015614	C	991-021450	J		
991-011576	D	991-015663	C	992-022773	G		
991-011706	D	991-016274	C	991-022774	L		

FREQUENCY DISTRIBUTION CHART

Voice Footages	Octave Frequency of Audio Signal																																																											
16'	C1	C#1	D1	D#1	E1	F1	F#1	G1	G#1	A1	A#1	B1	C2	C#2	D2	D#2	E2	F2	F#2	G2	G#2	A2	A#2	B2	C3	C#3	D3	D#3	E3	F3	F#3	G3	G#3	A3	A#3	B3	C4	C#4	D4	D#4	E4	F4	F#4	G4	G#4	A4	A#4	B4	C5	C#5	D5	D#5	E5	F5	F#5	G5	G#5	A5	A#5	B5	C6
8'	C2	C#2	D2	D#2	E2	F2	F#2	G2	G#2	A2	A#2	B2	C3	C#3	D3	D#3	E3	F3	F#3	G3	G#3	A3	A#3	B3	C4	C#4	D4	D#4	E4	F4	F#4	G4	G#4	A4	A#4	B4	C5	C#5	D5	D#5	E5	F5	F#5	G5	G#5	A5	A#5	B5	C6	C#6	D6	D#6	E6	F6	F#6	G6	G#6	A6	A#6	B6	C7
4'	C3	C#3	D3	D#3	E3	F3	F#3	G3	G#3	A3	A#3	B3	C4	C#4	D4	D#4	E4	F4	F#4	G4	G#4	A4	A#4	B4	C5	C#5	D5	D#5	E5	F5	F#5	G5	G#5	A5	A#5	B5	C6	C#6	D6	D#6	E6	F6	F#6	G6	G#6	A6	A#6	B6	C7	C#7	D7	D#7	E7	F7	F#7	G7	G#7	A7	A#7	B7	C8
2'	C4	C#4	D4	D#4	E4	F4	F#4	G4	G#4	A4	A#4	B4	C5	C#5	D5	D#5	E5	F5	F#5	G5	G#5	A5	A#5	B5	C6	C#6	D6	D#6	E6	F6	F#6	G6	G#6	A6	A#6	B6	C7	C#7	D7	D#7	E7	F7	F#7	G7	G#7	A7	A#7	B7	C8	C#8	D8	D#8	E8	F8	F#8	G8	G#8	A8	A#8	B8	C9
1'	C5	C#5	D5	D#5	D5	F5	F#5	G5	G#5	A5	A#5	B5	C6	C#6	D6	D#6	E6	F6	F#6	G6	G#6	A6	A#6	B6	C7	C#7	D7	D#7	E7	F7	F#7	G7	G#7	A7	A#7	B7	C8	C#8	D8	D#8	E8	F8	F#8	G8	G#8	A8	A#8	B8	C9	C#8	D8	D#8	E8	F8	F#8	G8	G#8	A8	A#8	B8	C9
5 1/3'	G2	G#2	A2	A#2	B2	C3	C#3	D3	D#3	E3	F3	F#3	G3	G#3	A3	A#3	B3	C4	C#4	D4	D#4	E4	F4	F#4	G4	G#4	A4	A#4	B4	C5	C#5	D5	D#5	E5	F5	F#5	G5	G#5	A5	A#5	B5	C6	C#6	D6	D#6	E6	F6	F#6	G6	G#6	A6	A#6	B6	C7	C#7	D7	D#7	E7	F7	F#7	G7
2 2/3'	G3	G#3	A3	A#3	B3	C4	C#4	D4	D#4	E4	F4	F#4	G4	G#4	A4	A#4	B4	C5	C#5	D5	D#5	E5	F5	F#5	G5	G#5	A5	A#5	B5	C6	C#6	D6	D#6	E6	F6	F#6	G6	G#6	A6	A#6	B6	C7	C#7	D7	D#7	E7	F7	F#7	G7	G#7	A7	A#7	B7	C8	C#8	D8	D#8	E8	F8	F#8	G8


C#1
D#1
F#1
G#1
A#1
C#2
D#2
F#2
G#2
A#2
C#3
D#3
F#3
G#3
A#3
C#4
D#4
F#4
G#4
A#4
C#5
D#5
F#5
G#5
A#5
C1
D1
E1
F1
G1
A1
B1
C2
D2
E2
F2
G2
A2
B2
C3
D3
E3
-F3
G3
A3
B3
C4
D4
E4
F4
G4
A4
B4
C5
D5
E5
F5
G5
A5
B5
C6

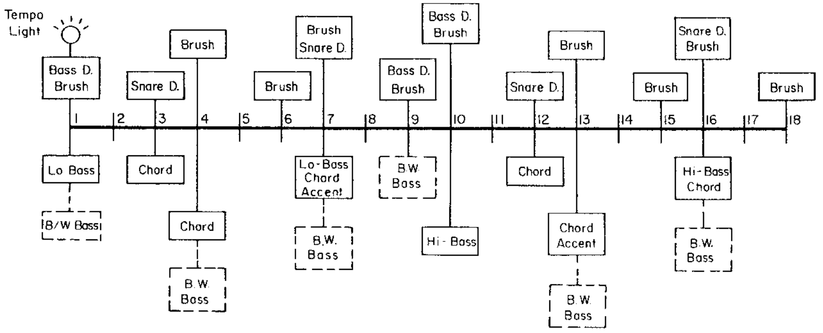
RHYTHM PATTERNS DIAGRAM

NOTE:

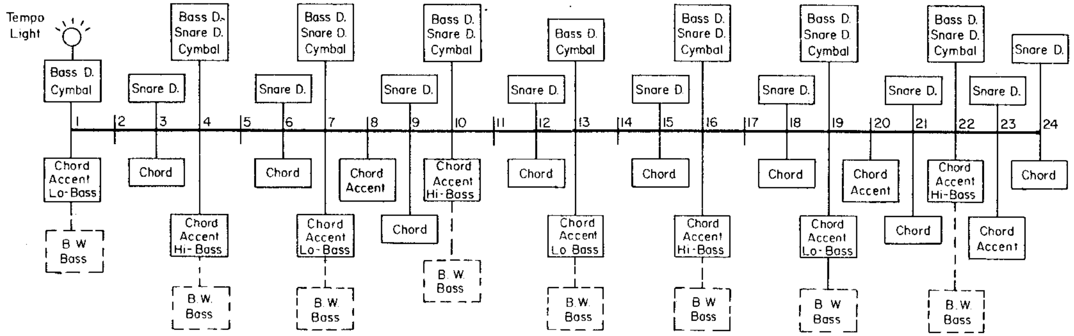
For Rhythms on this page and following page Strum Upbeat is coincident with Chord & Chord Accent pulse. Strum Downbeat is coincident with the Hi/Lo Bass Pulse or if B.W. Bass is on with the B.W. Bass Pulse, also Arpeggio is Triggered on every Rhythm Time Point.

⌜ ⌝ Indicates functions with Magic Chord Tab on.

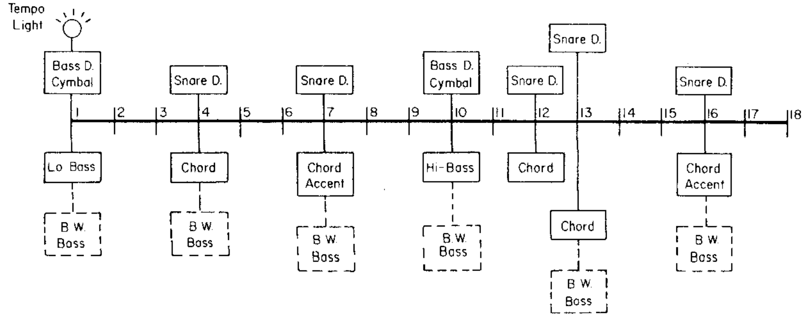
SWING WALTZ


Tempo Light
Bass D. Brush
Snare D.
Brush
Brush
Brush Snare D.
Bass D. Brush
Bass D. Brush
Snare D.
Brush
Brush
Snare D. Brush
Brush
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
Lo Bass
B/W Bass
Chord
Chord
B.W. Bass
Lo-Bass Chord Accent
B.W. Bass
B.W. Bass
Hi-Bass
Chord
Chord Accent
B.W. Bass
Hi-Bass Chord
B.W. Bass

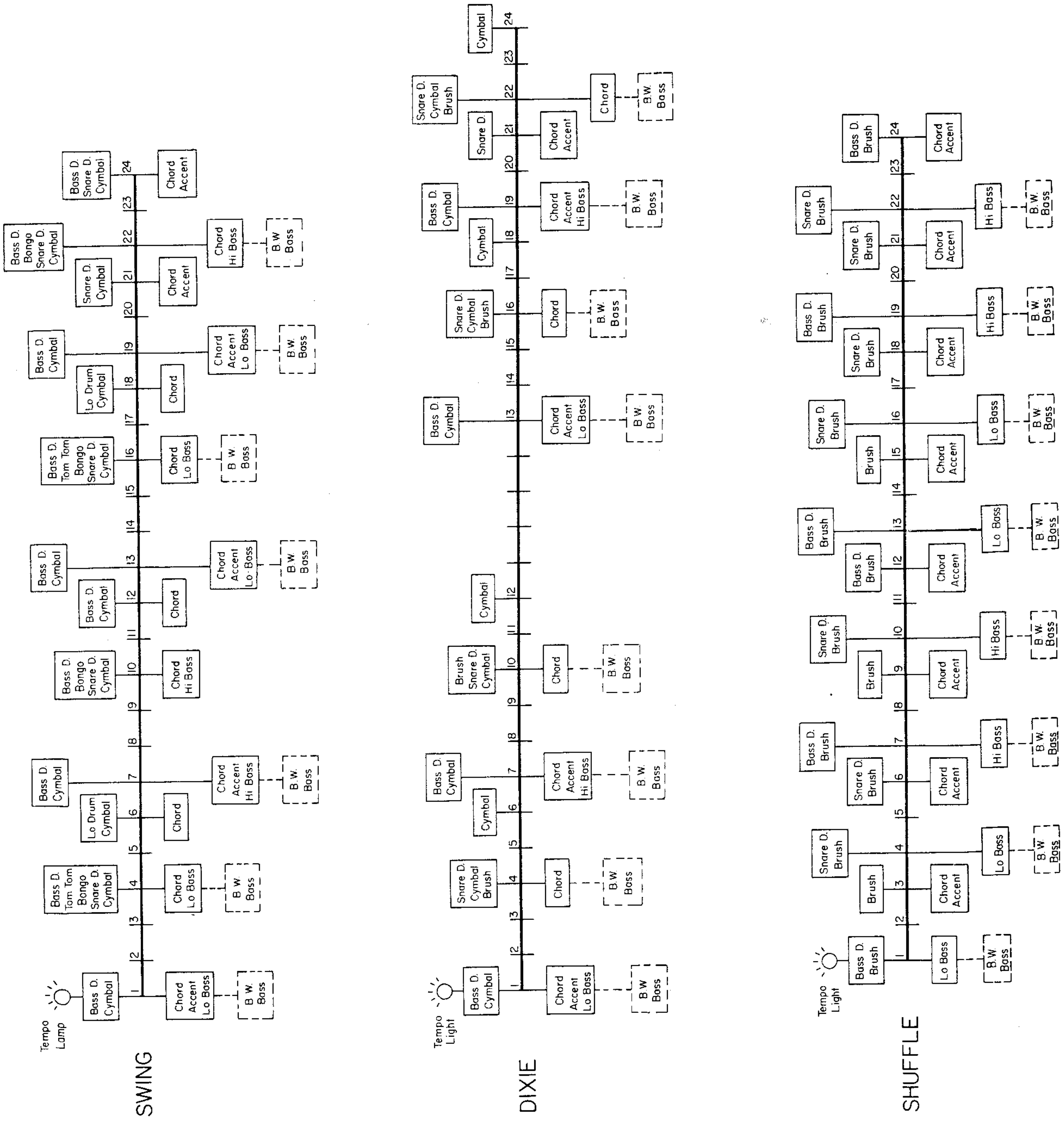
SWING MARCH


Tempo Light
Bass D. Cymbal
Snare D.
Bass D. Snare D. Cymbal
Snare D.
Bass D. Snare D. Cymbal
Snare D.
Bass D. Snare D. Cymbal
Snare D.
Bass D. Cymbal
Snare D.
Bass D. Snare D. Cymbal
Snare D.
Bass D. Snare D. Cymbal
Snare D.
Snare D.
Bass D. Snare D. Cymbal
Snare D.
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Chord Accent Lo-Bass
B.W. Bass
Chord
Chord Accent Hi-Bass
B.W. Bass
Chord
Chord Accent Lo-Bass
B.W. Bass
Chord Accent
Chord
Chord Accent Hi-Bass
B.W. Bass
Chord
Chord Accent Lo Bass
B.W. Bass
Chord
Chord Accent Hi-Bass
B.W. Bass
Chord
Chord Accent Lo-Bass
B.W. Bass
Chord Accent
Chord
Chord Accent Hi-Bass
B.W. Bass
Chord Accent
Chord

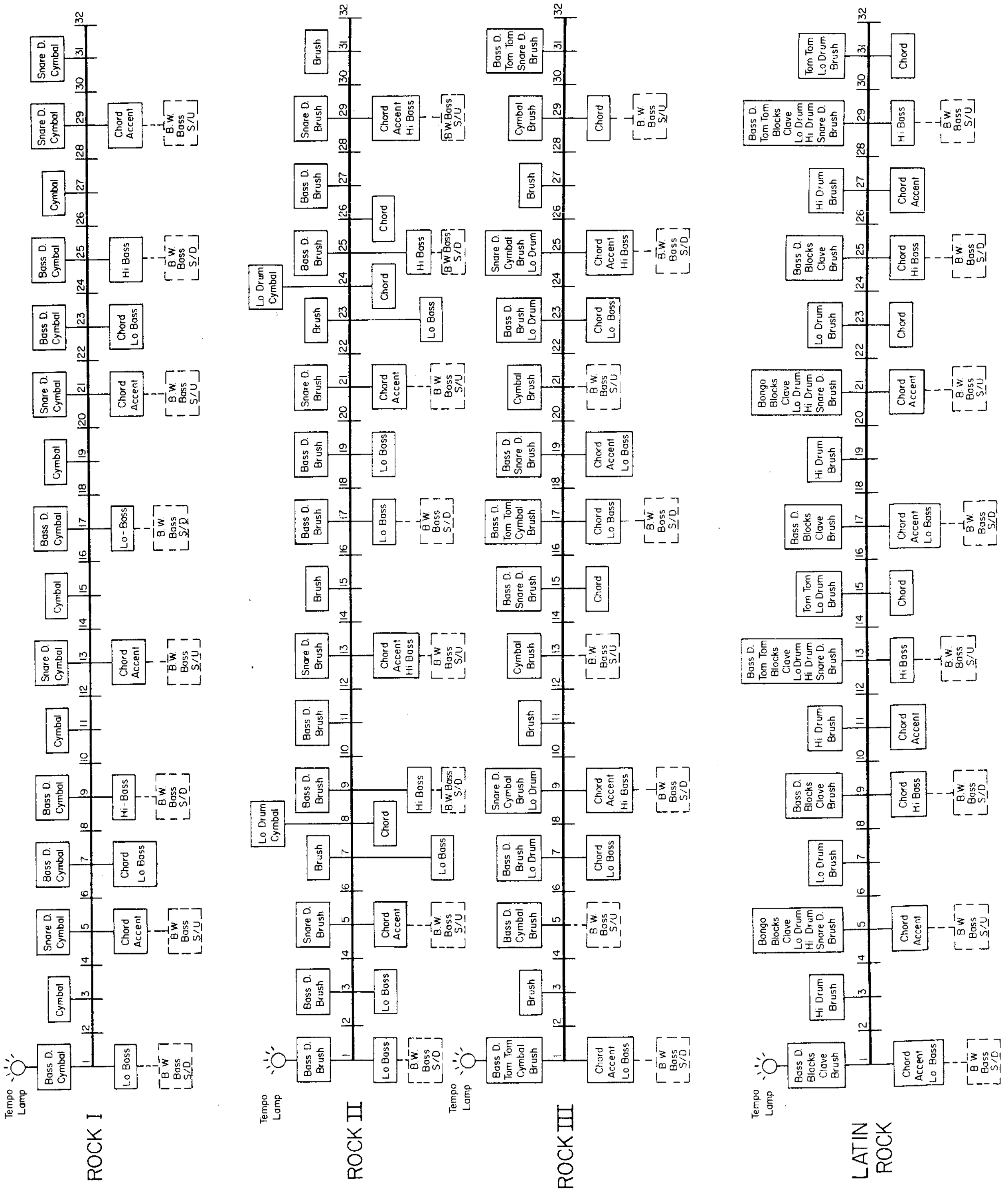
WALTZ


Tempo Light
Bass D. Cymbal
Snare D.
Snare D.
Bass D. Cymbal
Snare D.
Snare D.
Snare D.
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
Lo Bass
B.W. Bass
Chord
B.W. Bass
Chord Accent
B.W. Bass
Hi-Bass
B.W. Bass
Chord
Chord
B.W. Bass
Chord Accent
B.W. Bass

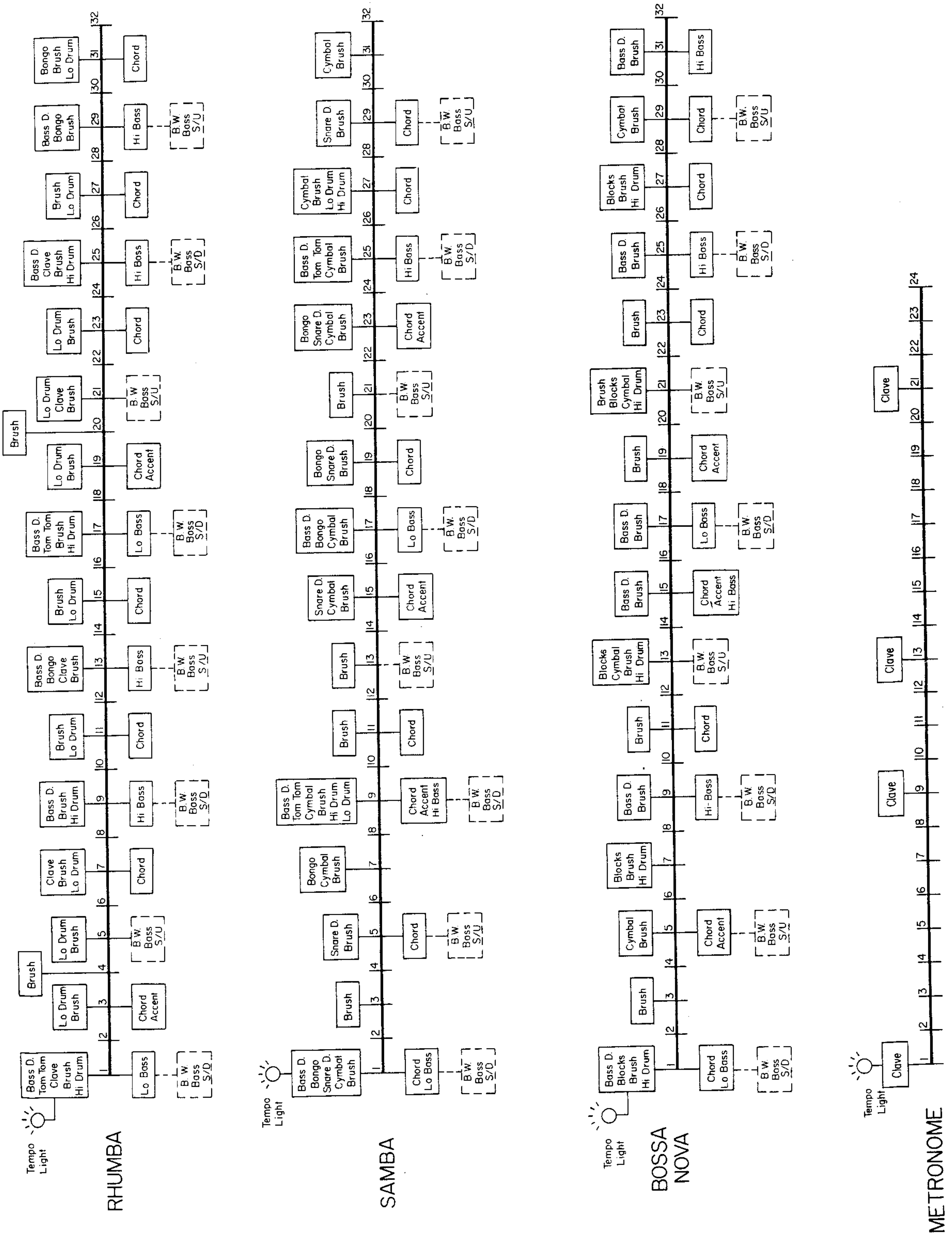
RHYTHM PATTERNS DIAGRAM


SWING
Tempo Lamp
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Bass D. Cymbal
Chord Accent Lo Bass
B.W. Bass
Bass D. Tom Tom Bongo Snare D. Cymbal
Chord Lo Bass
Lo Drum Cymbal
Chord
Bass D. Cymbal
Chord Accent Hi Bass
Bass D. Bongo Snare D. Cymbal
Chord Hi Bass
Chord Accent Lo Bass
Snare D. Cymbal
Chord Accent
Bass D. Snare D. Cymbal
DIXIE
Tempo Light
Bass D. Cymbal
Snare D. Cymbal Brush
Chord
Cymbal
Brush Snare D. Cymbal
Snare D.
Chord Accent Hi Bass
Chord Accent Lo Bass
SHUFFLE
Bass D. Brush
Lo Bass
Brush
Chord Accent
Snare D. Brush
Hi Bass

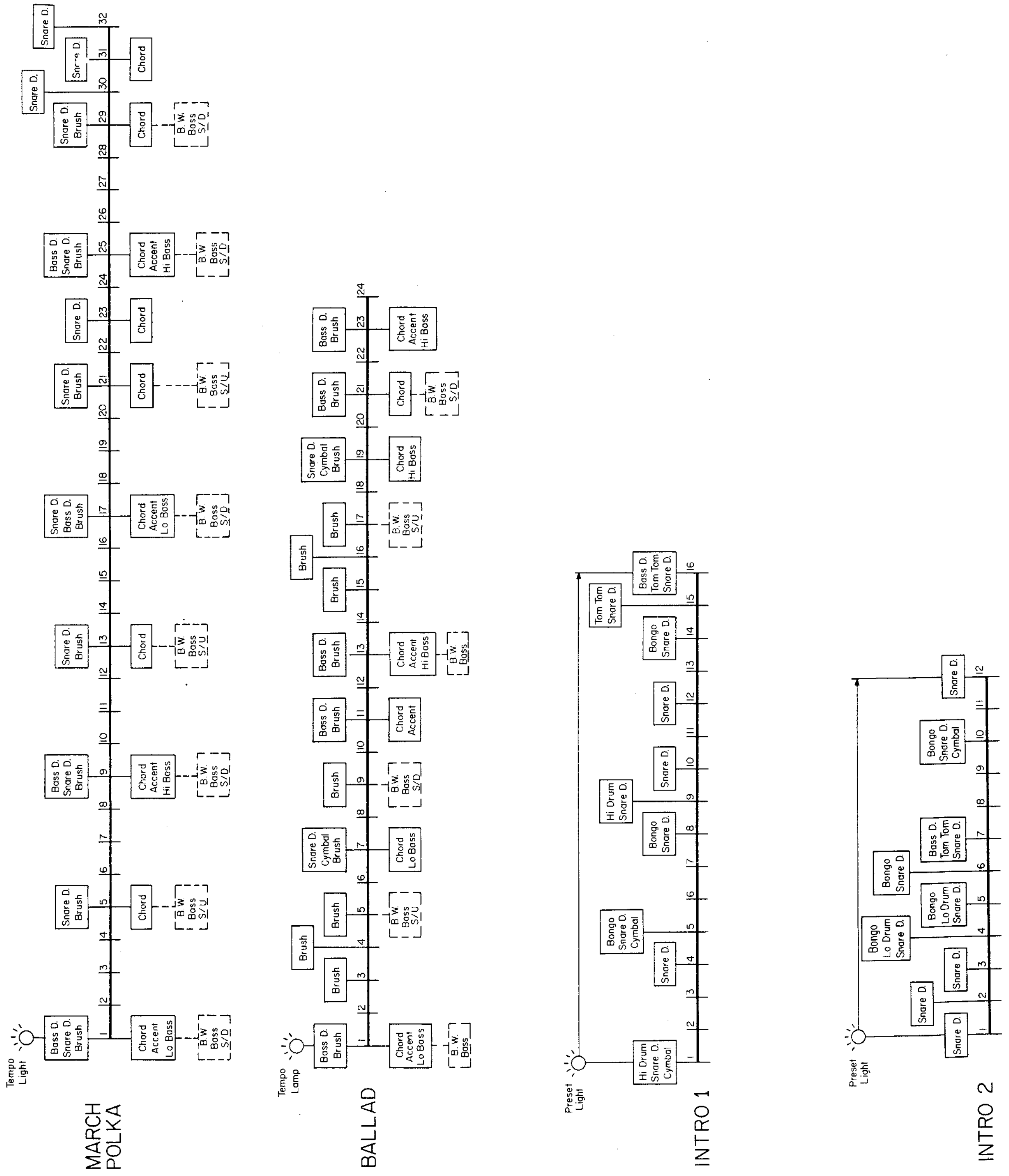
RHYTHM PATTERNS DIAGRAM


ROCK I
Tempo Lamp
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
Bass D. Cymbal
Lo Bass
B.W. Bass S/D
Cymbal
Snare D. Cymbal
Chord Accent
B.W. Bass S/U
Bass D. Cymbal
Chord Lo Bass
Bass D. Cymbal
Hi-Bass
B.W. Bass S/D
Cymbal
Snare D. Cymbal
Chord Accent
B.W. Bass S/U
Cymbal
Bass D. Cymbal
Lo-Bass
B.W. Bass S/D
Cymbal
Snare D. Cymbal
Chord Accent
B.W. Bass S/U
Bass D. Cymbal
Chord Lo Bass
Bass D. Cymbal
Hi Bass
B.W. Bass S/D
Cymbal
Snare D. Cymbal
Chord Accent
B.W. Bass S/U
Snare D. Cymbal
ROCK II
Tempo Lamp
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
Bass D. Brush
Lo Bass
B.W. Bass S/D
Bass D. Brush
Lo Bass
Snare D. Brush
Chord Accent
B.W. Bass S/U
Brush
Lo Bass
Lo Drum Cymbal
Chord
Bass D. Brush
Hi Bass
B.W. Bass S/D
Bass D. Brush
Snare D. Brush
Chord Accent Hi Bass
B.W. Bass S/U
Brush
Bass D. Brush
Lo Bass
B.W. Bass S/D
Bass D. Brush
Lo Bass
Snare D. Brush
Chord Accent
B.W. Bass S/U
Brush
Lo Bass
Lo Drum Cymbal
Chord
Bass D. Brush
Hi Bass
B.W. Bass S/D
Chord
Bass D. Brush
Snare D. Brush
Chord Accent Hi Bass
B.W. Bass S/U
Brush
ROCK III
Tempo Lamp
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
Bass D. Tom Tom Cymbal Brush
Chord Accent Lo Bass
B.W. Bass S/D
Brush
Bass D. Cymbal Brush
B.W. Bass S/U
Bass D. Brush Lo Drum
Chord Lo Bass
Snare D. Cymbal Brush Lo Drum
Chord Accent Hi Bass
B.W. Bass S/D
Brush
Cymbal Brush
B.W. Bass S/U
Bass D. Snare D. Brush
Chord
Bass D. Tom Tom Cymbal Brush
Chord Lo Bass
B.W. Bass S/D
Bass D. Snare D. Brush
Chord Accent Lo Bass
Cymbal Brush
B.W. Bass S/U
Bass D. Brush Lo Drum
Chord Lo Bass
Snare D. Cymbal Brush Lo Drum
Chord Accent Hi Bass
B.W. Bass S/D
Brush
Cymbal Brush
Chord
B.W. Bass S/U
Bass D. Tom Tom Snare D. Brush
LATIN ROCK
Tempo Lamp
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
Bass D. Blocks Clave Brush
Chord Accent Lo Bass
B.W. Bass S/D
Hi Drum Brush
Bongo Blocks Clave Lo Drum Hi Drum Snare D. Brush
Chord Accent
B.W. Bass S/U
Lo Drum Brush
Bass D. Blocks Clave Brush
Chord Hi Bass
B.W. Bass S/D
Hi Drum Brush
Chord Accent
Bass D. Tom Tom Blocks Clave Lo Drum Hi Drum Snare D. Brush
Hi Bass
B.W. Bass S/U
Tom Tom Lo Drum Brush
Chord
Bass D. Blocks Clave Brush
Chord Accent Lo Bass
B.W. Bass S/D
Hi Drum Brush
Bongo Blocks Clave Lo Drum Hi Drum Snare D. Brush
Chord Accent
B.W. Bass S/U
Lo Drum Brush
Chord
Bass D. Blocks Clave Brush
Chord Hi Bass
B.W. Bass S/D
Hi Drum Brush
Chord Accent
Bass D. Tom Tom Blocks Clave Lo Drum Hi Drum Snare D. Brush
Hi Bass
B.W. Bass S/U
Tom Tom Lo Drum Brush
Chord

RHYTHM PATTERNS DIAGRAM


RHUMBA
Tempo Light
1 Bass D. Tom Tom Clave Brush Hi Drum
Lo Bass
B.W. Bass S/D
3 Lo Drum Brush
Chord Accent
4 Brush
5 Lo Drum Brush
B.W. Bass S/U
7 Clave Brush Lo Drum
Chord
9 Bass D. Brush Hi Drum
Hi Bass
B.W. Bass S/D
11 Brush Lo Drum
Chord
13 Bass D. Bongo Clave Brush
Hi Bass
B.W. Bass S/U
15 Brush Lo Drum
Chord
17 Bass D. Tom Tom Brush Hi Drum
Lo Bass
B.W. Bass S/D
19 Lo Drum Brush
Chord Accent
20 Brush
21 Lo Drum Clave Brush
B.W. Bass S/U
23 Lo Drum Brush
Chord
25 Bass D Clave Brush Hi Drum
Hi Bass
B.W. Bass S/D
27 Brush Lo Drum
Chord
29 Bass D. Bongo Brush
Hi Bass
B.W. Bass S/U
31 Bongo Brush Lo Drum
Chord
32
SAMBA
Tempo Light
1 Bass D. Bongo Snare D. Cymbal Brush
Chord Lo Bass
B.W. Bass S/D
3 Brush
5 Snare D. Brush
Chord
B.W. Bass S/U
7 Bongo Cymbal Brush
9 Bass D. Tom Tom Cymbal Brush Hi Drum Lo Drum
Chord Accent Hi Bass
B.W. Bass S/D
11 Brush
Chord
13 Brush
B.W. Bass S/U
15 Snare D. Cymbal Brush
Chord Accent
17 Bass D. Bongo Cymbal Brush
Lo Bass
B.W. Bass S/D
19 Bongo Snare D. Brush
Chord
21 Brush
B.W. Bass S/U
23 Bongo Snare D. Cymbal Brush
Chord Accent
25 Bass D. Tom Tom Cymbal Brush
Hi Bass
B.W. Bass S/D
27 Cymbal Brush Lo Drum Hi Drum
Chord
29 Snare D Brush
Chord
B.W. Bass S/U
31 Cymbal Brush
32
BOSSA NOVA
Tempo Light
1 Bass D. Blocks Brush Hi Drum
Chord Lo Bass
B.W. Bass S/D
3 Brush
5 Cymbal Brush
Chord Accent
B.W. Bass S/U
7 Blocks Brush Hi Drum
9 Bass D. Brush
Hi-Bass
B.W. Bass S/D
11 Brush
Chord
13 Blocks Cymbal Brush Hi Drum
B.W. Bass S/U
15 Bass D. Brush
Chord Accent Hi Bass
17 Bass D. Brush
Lo Bass
B.W. Bass S/D
19 Brush
Chord Accent
21 Brush Blocks Cymbal Hi Drum
B.W. Bass S/U
23 Brush
Chord
25 Bass D. Brush
Hi Bass
B.W. Bass S/D
27 Blocks Brush Hi Drum
Chord
29 Cymbal Brush
Chord
B.W. Bass S/U
31 Bass D. Brush
Hi Bass
32
METRONOME
Tempo Light
1 Clave
9 Clave
13 Clave
21 Clave
24

RHYTHM PATTERNS DIAGRAM


MARCH POLKA
Tempo Light
Bass D. Snare D. Brush
Chord Accent Lo Bass
B.W. Bass S/D
Snare D. Brush
Chord
B.W. Bass S/U
Bass D. Snare D. Brush
Chord Accent Hi Bass
Snare D. Bass D. Brush
Chord Accent Lo Bass
Snare D.
Snare D. Brush
Chord Accent Hi Bass
BALLAD
Tempo Lamp
Bass D. Brush
Brush
Snare D. Cymbal Brush
Chord Lo Bass
Chord Accent
Chord Accent Hi Bass
B.W. Bass
Chord Hi Bass
INTRO 1
Preset Light
Hi Drum Snare D. Cymbal
Bongo Snare D. Cymbal
Bongo Snare D.
Hi Drum Snare D.
Tom Tom Snare D.
Bass D. Tom Tom Snare D.
INTRO 2
Bongo Lo Drum Snare D.
Bongo Snare D.
Bass D. Tom Tom Snare D.
Bongo Snare D. Cymbal
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32

PARTS INFORMATION

STANDARD PARTS

Replacements for all standard electronic parts and hardware may be purchased directly from local suppliers generally in less time than would be required to obtain them from the factory.

SPECIAL PARTS

In addition to the standard replacement parts, special electronic and mechanical parts are also used. These parts are manufactured by and to the specifications of the factory. Order these parts directly from the factory since they would be difficult or impossible to obtain from other sources.

PARTS ORDERING INFORMATION

When ordering parts be sure to include the following information:

1. Model and Serial Number
2. Part Number
3. A description of the part
4. Specify how you want the part shipped.

Most special electronic parts and mechanical parts will have a part number stamped on them. In the event that the part number is missing, or you are unable to read the part number, a complete description of the part and where it is used will allow the factory to fill your parts order. When parts are ordered in the proper manner the factory is able to fill your orders promptly—delays that might result are avoided.

ADDRESS PARTS ORDERS TO:

LOWREY ELECTRONICS PARTS DEPARTMENT
4400 W. 45th Street
Chicago, Illinois 60632

IMPORTANT

IN ANY CORRESPONDENCE CONCERNING THIS INSTRUMENT ALWAYS INCLUDE MODEL AND SERIAL NUMBERS

PARTS LIST

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THE PARTS LIST CONTAINS THE FOLLOWING INFORMATION:

1. Name of Part
2. Value, Tolerance and Code (When Important)
3. Brief description
4. Where the part is found (assembly, printed circuit board, etc.)
5. Schematic Reference Number
6. PART NUMBER — USE IT!

This parts list includes all standard stock replacement parts. No attempt has been made to include every nut, bolt and screw. If the necessity for a non-listed part arises, please write describing the parts location and function as well as model and serial number of the unit.

PARTS LIST

AMPLIFIER/EXPRESSION PEDAL/POWER SUPPLY & CROSSOVER ASSEMBLY

Part	Description	Schematic Reference	Part Number
Actuator	Arm		967-026076
Assembly	Control Arm		997-026151
Assembly	Glide Switch		997-028084
Assembly	Glide Switch		997-026150
Assembly	Glide Switch		997-026576
Assembly	Pedal & Mat		997-023127
Assembly	Power Supply		997-027667
Bulb	GE1819		939-003190
Capacitor	Electrolytic 10 uf 45V		945-008895-085
Capacitor	Electrolytic 500 Dual 40V		945-024505
Capacitor	Electrolytic 2500 uf Dual 25V		945-026659
Capacitor	Electrolytic 7500 45V		945-026652
Capacitor	Electrolytic 3500-2500 45V 3000 20V		945-026649
Capacitor	Electrolytic 50 uf 30V		945-008895-058
Capacitor	Electrolytic 1 uf 20V		945-008895-011
Capacitor	Electrolytic 1 uf 35V		945-008895-015
Capacitor	Electrolytic 15 uf 6V		945-008895-079
Capacitor	Electrolytic 2 uf 50V		945-026065
Capacitor	Electrolytic 50 uf 35V		945-008719-001
Capacitor	Crossover 60 uf		945-026788
Capacitor	Crossover 200 uf		945-025580
Capacitor	Polystyrene .022 uf 10% 50V		946-026037-223
Capacitor	Tantalum 27 uf 20% 35V		946-012624-276
Clip	Fuse		976-026063
Coil	Crossover 6.3 mh	L22	956-026066
Coil	Crossover 3.7 mh	L20	956-024553
Coil	Crossover 5 mh	L21	956-026787
Cord	Power		989-008717
Diffuser	White		922-015928-001
Diode	Bridge Rectifier 15 amps	D751	919-025522
Diode	1 amp 200V	D747, 752, 754-761	919-010623-001
Diode		D741-745, D748	919-024769
Diode	Bridge Rectifier 6 amps	D753	919-022736-003
Diode	4-junction	D746	919-026053
Fuse	5 amp 125V		939-013304-004
IC	-15V Regulator	IC175	992-026646-010
IC	-12V Regulator	IC176	992-026646-007
IC	+18V Regulator	IC172	992-024149-011
IC	Dual Op-Amp	IC166	991-025244
IC	+8V Regulator	IC170	992-024149-005
IC	+12V Regulator	IC173	992-024149-008
IC	+24V Regulator	IC171	992-024149-014
IC	+12V Regulator	IC174	992-024149-007
Mat	Glide Switch		959-009208-003
Mat	Glide Switch		959-009208-004
Mat	Swell Pedal		959-022953
Photocell	Expression Pedal	P5	948-018479
Potentiometer	25K Maximum Voltage Adjustment	VR63	925-021442-014

PARTS LIST

AMPLIFIER/EXPRESSION PEDAL/POWER SUPPLY & CROSSOVER ASSEMBLY (Continued)

Part	Description	Schematic Reference	Part Number
Potentiometer	250 Ohm Voltage Adjustment	VR67	925-004349-012
Potentiometer	500K Minimum Volume Adjustment	VR64	925-024590
Resistor	WW 25 Ohm 10% 20W		924-006811-093
Resistor	WW 12 Ohm 10% 15W		924-006811-121
Resistor	WW 4 Ohm 10% 15W		924-006811-120
Resistor	WW 150 Ohm 10% 2W		924-010471-151
Resistor	WW Fusible 5 Ohm 5W		924-026062-002
Resistor	WW Fusible .5 Ohm 5W		924-026062-003
Resistor	300 Ohm +5%		924-027382-301
Resistor	270 Ohm +5%		924-027382-271
Resistor	4700 5% 1W		851-251472
Socket	IC 8-Pin		906-021448
Spring	Compression		975-011747-001
Spring	Contact		917-027316
Transformer	Power	T1	954-026709
Transistor	NPN Darlington Driver	Q483	991-016727
Transistor	NPN Darlington Relay Driver	Q492	991-013543
Transistor	NPN Preamps	Q486, 487	991-026054
Transistor	PNP Driver	Q488	991-024184
Transistor	NPN Regulator, Switcher	Q485, 489	991-002232
Transistor	Power Darlington NPN Output	Q490	992-026039-002
Transistor	Power Darlington PNP Output	Q491	992-026040-002

BENCH ASSEMBLY

Part	Description	Schematic Reference	Part Number
Bench	Walnut		978-026396

CARILLON BOARD ASSEMBLY

Part	Description	Schematic Reference	Part Number
Capacitor	Metal Polyester .012 uf 5% 50V		946-026745-123
Capacitor	Metal Polyester .014 uf 5% 50V		946-026745-143
Capacitor	Metal Polyester .02 uf 5% 50V		946-026745-203
Capacitor	Metal Polyester .022 uf 5% 50V		946-026745-223
Capacitor	Metal Polyester .033 uf 5% 50V		946-026745-333
Capacitor	Metal Polyester .0047 uf 5% 50V		946-026745-472
Capacitor	Metal Polyester .0068 uf 5% 50V		946-026745-682
Capacitor	Metal Polyester .0082 uf 5% 50V		946-026745-822
Capacitor	Polystyrene .015 uf 10% 50V		946-026037-153
Capacitor	Polystyrene .33 uf 10% 50V		946-026037-334
Capacitor	Polystyrene .0047 uf 10% 50V		946-026037-472
Capacitor	Polystyrene .0068 uf 10% 50V		946-026037-682
Capacitor	Polystyrene .0082 uf 10% 50V		946-026037-822
Diode		D621	919-004799
Diode		All others	919-024769
IC	Quad Amp Carillon Filters	IC143	991-024103
Network	Reed String		949-024537
Socket	14-Pin		906-018905
Transistor	NPN Darlington Carillon Keyers	Q441-465	991-026617

PARTS LIST

CHORD FUNCTION GENERATOR BOARD ASSEMBLY

Part	Description	Schematic Reference	Part Number
Capacitor	Electrolytic 1 uf 20V		945-008895-011
Capacitor	Electrolytic 25 uf 25V	C13	945-008895-008
Capacitor	Electrolytic 2x2 uf 30V Dual		945-024186
Capacitor	Tantalum 1.0 uf 20% 35V		946-012624-105
Capacitor	Tantalum .22 uf 20% 35V		946-012624-224
Capacitor	Tantalum 5.6 uf 25V		946-021452-001
Diode		All	919-024769
IC	Chord Function Generator	IC85	991-026003
IC	Dual D Flip-Flop	IC89, 90	991-025225
IC	Quad Dual Input OR Gate	IC86, 87	991-025516
IC	Quad Dual Input NAND Gate	IC91	991-025515
IC	Quad Dual Input AND Gate	IC88	991-025517
IC	Quad Dual Input NAND Gate	IC92	991-024593
Network	23-Pin		949-024737
Potentiometer	50K 20% Chord Level Adjustment	VR40	925-004349-007
Socket	14-Pin		906-018905
Socket	40-Pin		906-022727
Transistor	NPN	Q271-274, 278-280, 284, 285, 289-292	991-002232
Transistor	NPN Preamps	Q275-277	991-002298

CHORUS MODULATOR BOARD ASSEMBLY

Part	Description	Schematic Reference	Part Number
Capacitor	Electrolytic 200 uf 25V	C7	945-008895
Capacitor	Electrolytic 6 uf 20V		945-008895-007
Capacitor	Electrolytic 100 uf 10V		945-008895-020
Capacitor	Electrolytic 100 uf 25V	C1-C4	945-008895-045
Capacitor	Electrolytic 20 mfd 25V		945-008895-030
Capacitor	Electrolytic 1 uf 35V		945-008895-015
Capacitor	Electrolytic 1 uf 20V		945-008895-011
Capacitor	Electrolytic 2 uf 20V		945-008895-032
Capacitor	Electrolytic 500 uf 18V	C6	945-008895-080
Capacitor	Tantalum 5.6 uf 25V		946-021452-001
Diode		D290-292	919-024769
IC	Bucket Brigade	IC79, 81, 83	991-020077-001
IC	Volume Regulator	IC164, 165	991-021444-001
IC	Voltage Controlled Oscillator	IC78, 80, 82	991-024543
Network			949-020068
Potentiometer	250K 20% Clock 1 Speed Adjustment	VR27	925-004349-002
Potentiometer	1M 20% Clock 2 Speed Adjustment	VR26	925-004349-004
Potentiometer	2500 Ohm 20% Phase 1,2,3 Level Adjustment	VR28, 29, 30	925-004349-011
Socket	IC 8-Pin		906-021448
Socket	IC 6-Pin		906-021448-001
Transistor	NPN Input Preamps Phase 1,2,3 Output Amps	Q203,204,222,230,238	991-002298
Transistor	NPN Oscillator	Q206-213,213,216,224 232	991-008393
Transistor	NPN Phase 1,2,3 Splitters	Q217-219,225-227, 233-235	991-010462

PARTS LIST

Part	Description	Schematic Reference	Part Number

CHORUS MODULATOR BOARD ASSEMBLY (Continued)

Part	Description	Schematic Reference	Part Number
Transistor	NPN Darlington	Q215,220,221,223,228, 229,231,236,237	991-013543
Transistor	Clock 1 & 2	Q205, 214	991-015316

CONSOLE ASSEMBLY

Part	Description	Schematic Reference	Part Number
Back	Walnut		972-026612
Key Cap (1)	Plastic (Black)		
Key Cap (2)	Plastic (White)		
Key Cap (3)	Complete (Black or White)		

(1) All are identical.

(2) Include Key Letter designation. (Example: A or F, etc.)

(3) Available on special order only. Include Key Letter designation and Key location. Replacement keys will require special hand-fitting due to the hand-built construction of keyboards.

Part	Description	Schematic Reference	Part Number
Rail	Up-stop		936-027378
Reverb	Spring Unit		984-017447
Speaker	12-inch, 4 ohm Base Main & Leslie		985-026627
Speaker	6x9-inch, 8 ohm Phase 2 & 3		985-009960-002
Speaker	8-inch, 8 ohm Main		985-003185-003

DC CONTROL BOARD ASSEMBLY

Part	Description	Schematic Reference	Part Number
Capacitor	Electrolytic 2 uf 50V		945-008895-065
Capacitor	Electrolytic 1 uf 25V		945-008895-038
Capacitor	Electrolytic 1 uf 35V		945-008895-015
Capacitor	Electrolytic 6 uf 20V		945-008895-007
Capacitor	Polystyrene .01 uf 10% 50V		946-026037-103
Capacitor	Polystyrene .15 uf 10% 50V		946-026037-154
Capacitor	Polystyrene .022 uf 10% 50V		946-026037-223
Capacitor	Polystyrene .22 uf 10% 50V		946-026037-224
Capacitor	Polystyrene .27 uf 10% 50V		946-026037-274
Capacitor	Polystyrene .33 uf 10% 50V		946-026037-334
Capacitor	Polystyrene .039 uf 10% 50V		946-026037-393
Capacitor	Polystyrene .068 uf 10% 50V		946-026037-683
Capacitor	Polystyrene .082 uf 10% 50V		946-026037-823
Capacitor	Tantalum 100 uf 10V		945-021452-009
Capacitor	Tantalum 1.0 uf 20% 35V		946-012624-105
Capacitor	Tantalum .22 uf 20% 35V		946-012624-224
Diode	Zener 10V	Z1	919-017406-057
Diode		D487	919-004799
Diode	Triple	D253	919-010454-001
Diode		All others	919-024769
IC	Dual Op-Amp	IC18	991-025244
IC	Quad Op-Amp	IC20	991-024103
IC	Quad Dual Input NAND Gate	IC1, 57	991-024593
IC	Dual D Flip-Flop	IC51, 52, 58	991-025225
IC	Quad Dual Input No.2 Gate	IC19	991-025536
IC	Hex Schmitt Trigger	IC21	991-025576

PARTS LIST

Part	Description	Schematic Reference	Part Number
DC CONTROL BOARD ASSEMBLY (Continued)			
Potentiometer	1M 20% Rest Adjustments	VR4, VR22	925-004349-004
Potentiometer	100K 20% Vibrato Speed Adjustment	VR1	925-004349-010
Resistor	WW 33 10% 2W		924-010471-330
Socket	14-Pin		906-018905
Transistor	NPN	Q332-338, 348-350	991-026315
Transistor	NPN	Q1,6,7,38-44,47-50,52-54,93-100,102,104,128	991-002232
Transistor	NPN Genie Accomp. Switcher	Q127	991-002298
Transistor	NPN	Q3, 34, 166	991-008393
Transistor	PNP	Q35,37,56-67,105-113, 126, 167, 495	991-010098
Transistor	NPN Vibrato Delay & Cancel Switcher	Q2	991-013544
Transistor	PNP Upper Keyboard Keyswitch Buss Driver	Q101	991-013599
Transistor	NPN Darlington	Q4, 45, 46, 51, 55	991-016727
Transistor	NPN Sustain Length Regulator	Q36	991-020425-001
GOLDEN HARP BOARD ASSEMBLY			
Capacitor	Polystyrene .022 uf 10% 50V		946-026037-223
Capacitor	Polystyrene .33 uf 10% 50V		946-026037-334
Diode		All	919-024769
IC	Dual D Flip-Flop	IC147	991-025225
IC	Up/Down Decoder	IC154	991-024595
IC	Quad Dual Input NAND Gate	IC149, 150	991-025515
IC	Quad Dual Input AND Gate	IC151, 157	991-025517
IC	Octave Count Decoder	IC156	991-026023
IC	Counters	IC153, 155	991-026024
IC	Quad Dual Input NOR Gate	IC148	991-026025
IC	Dual J-K Flip-Flop	IC152	991-026022
Socket	14-Pin		906-018905
Socket	16-Pin		906-018905-001
Socket	24-Pin		906-018905-002
Transistor	NPN	Q469-471, 474-479	991-002232
Transistor	NPN	Q472, 473	991-008393
LESLIE TREMOLO UNIT			
Assembly	Leslie Unit Complete		984-026339
Assembly	Motor		138756
Assembly	Rotor and Shaft		138761
Bearing	Plastic		137264
Belt	Drive		138675
Grommet	Neoprene		137255
Speaker	10-inch, 8-ohm		017202
Support	Rotor, Back		137256
Support	Rotor, Hub		137533
Support	Rotor, Steel Rod		138775

PARTS LIST

Part	Description	Schematic Reference	Part Number
LOWER FLUTE & SYMPHONIC STRING FILTER BOARD ASSEMBLY			
Capacitor	Electrolytic 10 uf 15V		945-019366-003
Capacitor	Electrolytic 25 uf 25V	C29, 38	945-008895-008
Capacitor	Electrolytic 10 uf 20V		945-008895-009
Capacitor	Electrolytic 1 uf 20V		945-008895-011
Capacitor	Electrolytic 1 uf 35V		945-008895-015
Capacitor	Electrolytic 4 uf 35V		945-008895-016
Capacitor	Electrolytic 100 uf 10V	C11	945-008895-020
Capacitor	Electrolytic 2 uf 50V		945-008895-065
Capacitor	Metal Polyester .01 uf 5% 50V		946-026745-103
Capacitor	Metal Polyester .0015 uf 5% 50V		946-026745-152
Capacitor	Metal Polyester .014 uf 5% 50V		946-026745-143
Capacitor	Metal Polyester .0012 uf 5% 50V		946-026745-122
Capacitor	Metal Polyester .0016 uf 5% 50V		946-026745-162
Capacitor	Metal Polyester .02 uf 5% 50V		946-026745-203
Capacitor	Metal Polyester .0024 uf 5% 50V		946-026745-242
Capacitor	Metal Polyester .027 uf 5% 50V		946-026745-273
Capacitor	Metal Polyester .0033 uf 5% 50V		946-026745-332
Capacitor	Metal Polyester .039 uf 5% 50V		946-026745-393
Capacitor	Metal Polyester .0047 uf 5% 50V		946-026745-472
Capacitor	Metal Polyester .056 uf 5% 50V		946-026745-563
Capacitor	Metal Polyester .0068 uf 5% 50V		946-026745-682
Capacitor	Polystyrene .001 uf 10% 50V		946-026037-102
Capacitor	Polystyrene .015 uf 10% 50V		946-026037-153
Capacitor	Polystyrene .01 uf 10% 50V		946-026037-103
Capacitor	Polystyrene .1 uf 10% 50V		946-026037-104
Capacitor	Polystyrene .0015 uf 10% 50V		946-026037-152
Capacitor	Polystyrene .0018 uf 10% 50V		946-026037-182
Capacitor	Polystyrene .022 uf 10% 50V		946-026037-223
Capacitor	Polystyrene .0022 uf 10% 50V		946-026037-222
Capacitor	Polystyrene .22 uf 10% 50V		946-026037-224
Capacitor	Polystyrene .0033 uf 10% 50V		946-026037-332
Capacitor	Polystyrene .039 uf 10% 50V		946-026037-393
Capacitor	Polystyrene .047 uf 10% 50V		946-026037-473
Capacitor	Polystyrene .0047 uf 10% 50V		946-026037-472
Capacitor	Polystyrene .0068 uf 10% 50V		946-026037-682
Capacitor	Polystyrene .0082 uf 10% 50V		946-026037-822
Capacitor	Polystyrene .0056 uf 10% 50V		946-026037-562
Capacitor	Tantalum 5.6 uf 25V		946-021452-001
Diode		All	919-024769
IC	Quad Op-Amp	IC39-45	991-024103
IC	Quad Op-Amp	IC46-48	991-025267
IC	Op-Amp	IC163	991-021444-001
Network	Reed String		949-024537
Socket	14-Pin		906-018905
Socket	8-Pin		906-021448
Transistor	FET Audio Switchers	Q82-85,87,89,119,120	991-022774
Transistor	NPN Switcher, Preamp	Q86, 88	991-018238
Transistor	NPN Darlington	Q485	991-026617

PARTS LIST

Part	Description	Schematic Reference	Part Number
LOWER KEYING CONTROL & DIODE READOUT BOARD ASSEMBLY			
Capacitor	Electrolytic 2x2 uf 30V Dual		945-024186
Capacitor	Tantalum 2.2 uf 35V		946-012624-225
Diode		All	919-024769
Network	14-Pin		949-022779
MAGIC GENIE 4-FOOT TOS, AOC & OSCILLATOR BOARD ASSEMBLY			
Capacitor	Electrolytic 10 uf 15V		945-019366-003
Capacitor	Electrolytic 25 uf 15V	C18	945-008895-029
Capacitor	Electrolytic 10 uf 20V		945-008895-009
Capacitor	Polystyrene 200 pf 5% 63V		946-024767-005
Coil	Chord Tuning Adjustment	L13	952-018874-006
Diode	Glide	D372	919-024117
Diode		D373	919-010873
Diode		All others	919-024769
IC	Dual D Flip-Flop	IC93-96	991-025225
IC	33-Bit Decoder	IC99	991-022793
IC	4-Foot TOS	IC98	991-018813-001
IC	4-Foot TOS	IC97	991-018813-002
Network	22K		949-025521-001
Network	100K		949-025521-002
Network	470K		949-025521-003
Resistor	WW 220 Ohm 10% 2W		924-010471-221
Socket	40-Pin		906-022727
Socket	14-Pin		906-018905
Transistor	NPN Chord Function Master Oscillator	Q287	991-025535
Transistor	NPN	Q281,282,286,288	991-002232
Transistor	NPN Darlington	Q283	991-026617
MAIN & PEDAL QC BOARD ASSEMBLY			
Capacitor	Electrolytic 500 uf 18V	C10	945-008895-080
Capacitor	Electrolytic 50 uf 15V	C31, 37	945-008895-005
Capacitor	Electrolytic 1 uf 20V		945-008895-011
Capacitor	Electrolytic 1 uf 35V		945-008895-015
Capacitor	Electrolytic 100 uf 10V		945-008895-020
Capacitor	Electrolytic 100 uf 15V		945-008895-044
Capacitor	Electrolytic 100 uf 25V		945-008895-045
Capacitor	Electrolytic 2 uf 50V		945-008895-065
Capacitor	Polystyrene .015 uf 10% 50V		946-026037-153
Capacitor	Polystyrene .15 uf 10% 50V		946-026037-154
Capacitor	Polystyrene .0022 uf 10% 50V		946-026037-222
Capacitor	Polystyrene .022 uf 10% 50V		946-026037-223
Capacitor	Polystyrene .22 uf 10% 50V		946-026037-224
Capacitor	Polystyrene .0033 uf 10% 50V		946-026037-332
Capacitor	Polystyrene .033 uf 10% 50V		946-026037-333
Capacitor	Polystyrene .33 uf 10% 50V		946-026037-334
Capacitor	Polystyrene .0039 uf 10% 50V		946-026037-392
Capacitor	Polystyrene .0047 uf 10% 50V		946-026037-472
Capacitor	Polystyrene .047 uf 10% 50V		946-026037-473
Capacitor	Polystyrene .0068 uf 10% 50V		946-026037-682

PARTS LIST

MAIN & PEDAL QC BOARD ASSEMBLY (Continued)

Part	Description	Schematic Reference	Part Number
Capacitor	Polystyrene .068 uf 10% 50V		946-026037-683
Capacitor	Polystyrene .0082 uf 10% 50V		946-026037-822
Capacitor	Polystyrene .1 uf 10% 50V		946-026037-104
Capacitor	Tantalum 5.6 uf 25V		946-021452-001
Diode		All	919-024769
IC	Op-Amp	IC55,62,66,67,74,75,102	991-021444-001
IC	Dual Op-Amp	IC56, 73, 161	991-025244
IC	Quad Op-Amp	IC61, 65	991-024103
IC	Quad Op-Amp	IC63, 64	991-025267
Network	Reed String		949-024537
Potentiometer	50K 20% Genie, Percussion Thump Adjust	VR15, 19	925-004349-007
Socket	IC 8-Pin		906-021448
Socket	14-Pin		906-018905
Transistor	NPN Bass Med.,Bass Full Switchers	Q198, 199	991-002232
Transistor	NPN Bass Emitter Follower	Q200	991-002298
Transistor	NPN Switcher	Q147	991-008393
Transistor	NPN Darlington Emitter Followers	Q149, 150, 195, 196	991-016727
Transistor	FET Audio Switch	All others	991-022774
Transistor	NPN Darlington Main Output Amp	Q484	991-026617

ORCHESTRAL SYMPHONIZER KEYER BOARD ASSEMBLY

Part	Description	Schematic Reference	Part Number
Diode		All	919-024769
Transistor	Pulse Keyer	Q405, 407	991-008393

ORCHESTRAL SYMPHONIZER KEYING CONTROL BOARD 1 & 2

Part	Description	Schematic Reference	Part Number
Capacitor	Polystyrene .22 uf 10% 50V		946-026037-224
Capacitor	Polystyrene .27 uf 10% 50V		946-026037-274
Capacitor	Polystyrene .33 uf 10% 50V		946-026037-334
Diode		All others	919-024769
Diode		D556, 557	919-004799
Transistor	NPN Darlington Orch. Symp. Keyer	Q404, 406	991-026617

ORCHESTRAL SYMPHONIZER LATCH BOARD ASSEMBLY

Part	Description	Schematic Reference	Part Number
Capacitor	Electrolytic 25 uf 25V	C26	945-008895-008
Capacitor	Electrolytic 2 uf 50V		945-008895-065
Capacitor	Electrolytic 6 uf 20V		945-008895-007
Capacitor	Polystyrene .033 uf 10% 50V		946-026037-333
Diode		All	919-024769
IC	Up/Down Decoder	IC120	991-024595
IC	8-Bit Priority Encoder	IC113, 114	991-025599
IC	Dual D Flip-Flop	IC115, 116	991-025225
IC	Quad Dual Input Exclusive OR Gate	IC117	991-026005
IC	Dual Up Counter	IC119	991-026006
IC	Quad Dual Input NOR Gate	IC118	991-025536
Socket	14-Pin		906-018905
Socket	16-Pin		906-018905-001
Socket	24-Pin		906-018905-002
Transistor	PNP Low Voltage Keying Switcher	Q393	991-013599

PARTS LIST

ORCHESTRAL SYMPHONIZER LATCH BOARD ASSEMBLY (Continued)

Part	Description	Schematic Reference	Part Number
Transistor	NPN Darlington	Q397	991-016727
Transistor	NPN	Q389,392,398-401,403	991-013544
Transistor	NPN	Q390, 394, 395	991-002232
Transistor	PNP	All others	991-010098
Transistor	NPN Darlington	Q391	991-015663

ORCHESTRAL SYMPHONIZER QUALITY CONTROL BOARD ASSEMBLY

Part	Description	Schematic Reference	Part Number
Capacitor	Electrolytic 50 uf 15V		945-008895-005
Capacitor	Electrolytic 25 uf 25V	C9, 36	945-008895-008
Capacitor	Electrolytic 15 uf 50V		945-008895-003
Capacitor	Electrolytic 1 uf 35V		945-008895-015
Capacitor	Electrolytic 4 uf 35V		945-008895-016
Capacitor	Electrolytic 100 uf 10V	C34, 42	945-008895-020
Capacitor	Electrolytic 20 mfd 25V		945-008895-030
Capacitor	Electrolytic 100 uf 15V		945-008895-044
Capacitor	Electrolytic 500 uf 18V	C33, 41	945-008895-080
Capacitor	Electrolytic 2 uf 50V		945-008895-065
Capacitor	Electrolytic 10 uf 25V		945-008895-091
Capacitor	Polystyrene .047 uf 10% 50V		946-026037-473
Capacitor	Polystyrene .022 uf 10% 50V		946-026037-223
Capacitor	Polystyrene .22 uf 10% 50V		946-026037-224
Capacitor	Polystyrene .27 uf 10% 50V		946-026037-274
Capacitor	Polystyrene .0022 uf 10% 50V		946-026037-222
Capacitor	Polystyrene .0047 uf 10% 50V		946-026037-472
Capacitor	Polystyrene .01 uf 10% 50V		946-026037-103
Capacitor	Polystyrene .012 uf 10% 50V		946-026037-123
Capacitor	Polystyrene .0068 uf 10% 50V		946-026037-682
Capacitor	Polystyrene .033 uf 10% 50V		946-026037-333
Capacitor	Polystyrene .0015 uf 10% 50V		946-026037-152
Capacitor	Polystyrene .0033 uf 10% 50V		946-026037-332
Capacitor	Polystyrene .0039 uf 10% 50V		946-026037-392
Capacitor	Polystyrene .027 uf 10% 50V		946-026037-273
Capacitor	Polystyrene .001 uf 10% 50V		946-026037-102
Capacitor	Polystyrene .015 uf 10% 50V		946-026037-153
Capacitor	Polystyrene .068 uf 10% 50V		946-026037-683
Capacitor	Polystyrene .0012 uf 10% 50V		946-026037-122
Capacitor	Polystyrene .15 uf 10% 50V		946-026037-154
Capacitor	Polystyrene .1 uf 10% 50V		946-026037-104
Capacitor	Polystyrene .018 uf 10% 50V		946-026037-183
Capacitor	Polystyrene .039 uf 10% 50V		946-026037-393
Capacitor	Polystyrene .0082 uf 10% 50V		946-026037-822
Capacitor	Tantalum 2.2 uf 35V		946-012624-225
Diode		All others	919-024769
Diode		D525-535	919-004799
IC	Op-Amp	IC133-136	991-021444-001
IC	Quad Op-Amp	IC123-130, 132, 139	991-025267
IC	Dual Op-Amp	IC131	991-025244
IC	Bucket Brigade	IC140	991-025584
Potentiometer	10K 20% Bias Adjustment	VR53	925-004349-003

PARTS LIST

Part	Description	Schematic Reference	Part Number
ORCHESTRAL SYMPHONIZER QUALITY CONTROL BOARD ASSEMBLY (Continued)			
Potentiometer	1M 20% Speed Adjustment	VR54	925-004349-004
Socket	IC 8-Pin		906-021448
Socket	14-Pin		906-018905
Transistor	PNP	Q435, 436, 437, 438	991-010098-003
Transistor	PNP Chorus Enable	Q434	991-010098-004
Transistor	NPN Darlington	Q421, 422, 430, 434	991-016727
Transistor	NPN Darlington	Q429	991-013543
Transistor	NPN	Q416	991-002232
Transistor	FET Audio Switch	Q411-415, 418-470, 423-428	991-022774
Transistor	NPN Darlington	Q384	991-015663
Transistor	NPN	All others	991-013544
RHYTHM CLOCK BOARD ASSEMBLY			
Capacitor	Electrolytic 1000 uf 15V	C21	945-008895-061
Diode		All	919-024769
IC	Resettable Counter	IC102	991-018495
IC	ROM	IC103	991-022729
Socket	40-Pin		906-022727
Socket	16-Pin		906-018905-001
Transistor	NPN	All others	991-008393
Transistor	PNP	Q184,295,296,311-313, 318,319,322-324,326-329	991-010098
Transistor	NPN Darlington Driver	Q185, 300	991-016727
Transistor	PNP Darlington Clock Multivibrator	Q297, 298	991-018493
Transistor	NPN Intro Hold Reset	Q315	991-002232
RHYTHM INSTRUMENTATION BOARD ASSEMBLY			
Capacitor	Electrolytic 50 uf 25V	C14, 43	945-027385
Capacitor	Electrolytic 2 uf 25V		945-015619
Capacitor	Metal Polyester .0068 uf 20% 50V		946-026795-682
Capacitor	Metal Polyester .1 uf 20% 50V		946-026795-104
Capacitor	Metal Polyester .22 uf 20% 50V		946-026795-224
Capacitor	Metal Polyester .12 uf 5% 50V		946-026745-124
Capacitor	Metal Polyester .0039 uf 5% 50V		946-026745-392
Capacitor	Metal Polyester .0018 uf 5% 50V		946-026745-182
Capacitor	Metal Polyester .0022 uf 5% 50V		946-026745-222
Capacitor	Metal Polyester .0056 uf 5% 50V		946-026745-562
Capacitor	Metal Polypropylene .068 uf 5% 50V		946-026784-683
Capacitor	Metal Polypropylene .1 uf 5% 50V		946-026784-104
Capacitor	Metal Polypropylene .033 uf 5% 50V		946-026784-333
Capacitor	Metal Polypropylene .039 uf 5% 50V		946-026784-393
Capacitor	Polypropylene .0051 uf 2.5% 50V		946-027302-512
Capacitor	Polypropylene .01 uf 2.5% 50V		946-027302-103
Capacitor	Polystyrene .27 uf 10% 50V		946-026037-274
Capacitor	Polystyrene .068 uf 10% 50V		946-026037-683
Capacitor	Polystyrene .033 uf 10% 50V		946-026037-333
Capacitor	Polystyrene .1 uf 10% 50V		946-026037-104

PARTS LIST

Part	Description	Schematic Reference	Part Number
RHYTHM INSTRUMENTATION BOARD ASSEMBLY (Continued)			
Diode		D484-486	919-004799
Diode		All others	919-024769
IC	Digital Noise Generator	IC110	991-024108
IC	Quad Op-Amp	IC107-109	991-022794
IC	Hex Inverter	IC106	991-024594
Socket	8-Pin		906-021448
Socket	14-Pin		906-018905
Transistor	NPN	All others	991-026315
Transistor	PNP Genie Modulator Keyer	Q309	991-010098
TAB PANEL ASSEMBLY			
Bulb			939-018289
Guide	Slider		976-005170-001
Jack	Headphone		910-024526
Knob	White Pearl		915-026335-001
Knob	Red Variegated		915-026335-002
Knob	Blue Variegated		915-026335-003
Knob	Yellow Variegated		915-026335-004
Knob	Green Variegated		915-026335-005
Knob	Gray Variegated		915-026335-006
Lens	White		922-018413-001
Lens	Red		922-018413-002
Lens	Blue		922-018413-003
Lens	Yellow		922-018413-004
Lens	Green		922-018413-005
Potentiometer	10K Sustain Length, Rhythm Balance, Reverb Length	VR5,46, 62	925-021442-007
Potentiometer	5K Vibrato Depth Control	VR2	925-021442-008
Potentiometer	100K Vibrato Speed, Wow Range Control	VR3, 23	925-021442-009
Potentiometer	1M Rhythm Speed Control	VR43	925-021442-010
Potentiometer	1.5M Repeat Speed Control	VR6	925-021442-011
Potentiometer	10K Lower Flute Volume, Upper String Volume, Lower String/Vox Volume, Genie Volume, Arpeggio Volume, Strum Volume	VR9,11,12,16,38,39	925-021442-012
Potentiometer	500K Harp Speed Control	VR60	925-021442-015
Potentiometer	1K Orch. Volume Control	VR51	925-021442-016
Potentiometer	10K Rhythm Volume	VR47	925-021442-017
Pushbutton	White Pearl		915-024199-007
Pushbutton	Black		915-024199-017
Pushbutton	Gray Variegated		915-024199-005
Pushbutton	Red Variegated		915-024199-008
Pushbutton	Yellow Variegated		915-024199-009
Pushbutton	Green Variegated		915-024199-006
Pusher	Medium		964-025555
Socket	Lamp		906-026038
Spring	Toggle		975-025543
Spring	Contact		917-005166-004
Switch	Pushbutton		960-018286
Switch	Pushbutton AC		960-026662-001

PARTS LIST

TAB PANEL ASSEMBLY (Continued)

Part	Description	Schematic Reference	Part Number
Switch	On/Off White		960-010669-004
Switch	Pushbutton 6-Position		960-024525-001
Switch	Pushbutton 4-Position		960-024525-003
Switch	Pushbutton 17-Position		960-024525
Tab	AOC		915-025544-005
Tab	Accordion		915-025544-010
Tab	Banjo		915-025544-014
Tab	Bass Full		915-025544-048
Tab	Bass Medium		915-025544-049
Tab	Boogie Woogie Bass		915-025544-025
Tab	Cello 16		915-025544-023
Tab	Chord Hold		915-025544-031
Tab	Diaphone 16		915-025544-076
Tab	Electric Piano		915-025544-016
Tab	English Horn 8		915-025544-060
Tab	Flute 16		915-025544-039
Tab	Flute 8		915-025544-038
Tab	Flute 5-1/3		915-025544-037
Tab	Flute 4		915-025544-036
Tab	Flute 2-2/3		915-025544-035
Tab	Flute 2		915-025544-034
Tab	Flute 1		915-025544-069
Tab	Genie Guitar Bass		915-025544-050
Tab	Genie Plus Organ		915-025544-043
Tab	Genie String Bass		915-025544-051
Tab	Golden Harp		915-025544-077
Tab	Guitar		915-025544-045
Tab	Guitar Strum		915-025544-030
Tab	Harmonic 2-2/3		915-025544-012
Tab	Harmonic 4		915-025544-013
Tab	Harpsichord		915-025544-024
Tab	Harpsichord Arpeggio		915-025544-026
Tab	Hawaiian Guitar		915-025544-018
Tab	Kinura 8		915-025544-040
Tab	Magic Genie Chords		915-025544-032
Tab	Mandolin		915-025544-015
Tab	Orchestral Clarinet		915-025544-011
Tab	Orchestral to Lower		915-025544-083
Tab	Orchestral to Pedal		915-025544-059
Tab	Pedal 8		915-025544-055
Tab	Pedal 16		915-025544-056
Tab	Pedal Guitar Bass		915-025544-054
Tab	Pedal Sustain		915-025544-057
Tab	Pedal Wow		915-025544-052
Tab	Percuss Long		915-025544-004
Tab	Piano		915-025544-017
Tab	Piano Arpeggio		915-025544-027
Tab	Piccolo		915-025544-009
Tab	Repeat Percuss		915-025544-003
Tab	Rhythm Start		915-025544-046
Tab	Rhythm Start Auto		915-025544-047

PARTS LIST

TAB PANEL ASSEMBLY (Continued)

Part	Description	Schematic Reference	Part Number
Tab	Strum Downbeat		915-025544-028
Tab	Sustain		915-025544-002
Tab	Symphonic Wow		915-025544-007
Tab	Trombone 16		915-025544-042
Tab	Trumpet 16		915-025544-041
Tab	Ukulele		915-025544-044
Tab	Ukulele Strum		915-025544-029
Tab	Vibes		915-025544-020
Tab	Vibra Harp		915-025544-019
Tab	Vibrato		915-025544-006
Tab	Viola 8		915-025544-022
Tab	Violin		915-025544-008
Tab	Violina 4		915-025544-021
Tab	Vox Celeste 4		915-025544-079
Tab	Vox Humana 8		915-025544-066
Tab	Wow Attack Slow		915-025544-001

TONE GENERATOR BOARD ASSEMBLY

Part	Description	Schematic Reference	Part Number
Capacitor	Electrolytic 50 uf 20V	C16	945-008895-012
Capacitor	Electrolytic 1 uf 20V		945-008895-011
Capacitor	Electrolytic 4 uf 20V		945-002333
Capacitor	Electrolytic 1 uf +50 -10% 50V		945-016692
Capacitor	Polystyrene .22 uf 10% 50V (on stand-up board)		946-026037-224
Capacitor	Polystyrene .1 uf 10% 50V		946-026037-104
Capacitor	Polystyrene .22 uf 10% 50V		946-026037-224
Capacitor	Polystyrene .033 uf 10% 50V		946-026037-333
Capacitor	Polystyrene .33 uf 10% 50V		946-026037-334
Capacitor	Polystyrene .0056 uf 10% 50V		946-026037-562
Capacitor	Polystyrene .068 uf 10% 50V		946-026037-683
Capacitor	Polystyrene 150 pf 2-1/2% 33V		946-013181-151
Capacitor	Tantalum 5.6 uf 25V		946-021452-001
Capacitor	Tantalum 1.0 uf 35V		946-021452-002
Coil	28 uh Tuning Adjustment	L1	952-018874-002
Diode	Glide	D11	919-024117
Diode		All others	919-024769
Diode		D225, 229, 230	919-004799
Diode	(On stand-up board)	D243	919-024769
IC	TOS	IC2	991-018813-001
IC	TOS	IC3	991-018813-002
IC	6-stage Divider	IC4-15, 70	991-021331-002
Resistor	WW 220 Ohm 10% 2W		924-010471-221
Socket	14-Pin		906-018905
Transistor	NPN Darlington Collector Amps	Q164, 165	991-016727
Transistor	NPN	Q172, 173	991-013544
Transistor	PNP	Q171	991-015614
Transistor	NPN Keyer	Q170	991-018238
Transistor	NPN Darlington Keyer	Q155	991-026617
Transistor	PNP	Q158, 163, 169, 174	991-010098
Transistor	NPN	Q5, 157, 162, 168, 175, 176	991-002232

PARTS LIST

TONE GENERATOR BOARD ASSEMBLY (Continued)

Part	Description	Schematic Reference	Part Number
Transistor	NPN	Q156, 161	991-008393
Transistor	NPN Master Oscillator, Buffers	Q8-10	991-025535

TONE GENERATOR BUFFER BOARD ASSEMBLY

Part	Description	Schematic Reference	Part Number
Capacitor	Metal Polyester .001 uf 20% 50V		946-026795-102
Capacitor	Metal Polyester .0022 uf 20% 50V		946-026795-222
Capacitor	Metal Polyester .0047 uf 20% 50V		946-026795-472
Capacitor	Metal Polyester .01 20% 50V		946-026795-103
Capacitor	Metal Polyester .022 uf 20% 50V		946-026795-223
Capacitor	Metal Polyester .033 uf 20% 50V		946-026795-333
Capacitor	Metal Polyester .047 uf 20% 50V		946-026795-473
Capacitor	Metal Polyester .068 uf 20% 50V		946-026795-683
Capacitor	Metal Polyester .1 uf 20% 50V		946-026795-104
Diode		All	919-024769
Transistor	PNP Buffers	Q11-29	991-010098

UPPER DIODE READOUT BOARD ASSEMBLY

Part	Description	Schematic Reference	Part Number
Diode		All	919-024769
Network	14-Pin		949-022779

UPPER FLUTE & SYMPHONIC STRING FILTER BOARD ASSEMBLY

Part	Description	Schematic Reference	Part Number
Capacitor	Electrolytic 75 uf 10V		945-024539
Capacitor	Electrolytic 1 uf 20V		945-008895-011
Capacitor	Electrolytic 4 uf 35V		945-008895-016
Capacitor	Electrolytic 2 uf 50V		945-008895-065
Capacitor	Metal Polyester .001 uf 5% 50V		946-026745-102
Capacitor	Metal Polyester .01 uf 5% 50V		946-026745-103
Capacitor	Metal Polyester .1 uf 5% 50V		946-026745-104
Capacitor	Metal Polyester .0015 uf 5% 50V		946-026745-152
Capacitor	Metal Polyester .15 uf 5% 50V		946-026745-154
Capacitor	Metal Polyester .12 uf 5% 50V		946-026745-124
Capacitor	Metal Polyester .015 uf 5% 50V		946-026745-153
Capacitor	Metal Polyester .0016 uf 5% 50V		946-026745-162
Capacitor	Metal Polyester .22 uf 5% 50V		946-026745-224
Capacitor	Metal Polyester .0022 uf 5% 50V		946-026745-222
Capacitor	Metal Polyester .027 uf 5% 50V		946-026745-273
Capacitor	Metal Polyester .02 uf 5% 50V		946-026745-203
Capacitor	Metal Polyester .002 uf 5% 50V		946-026745-202
Capacitor	Metal Polyester .022 uf 5% 50V		946-026745-223
Capacitor	Metal Polyester .0024 uf 5% 50V		946-026745-242
Capacitor	Metal Polyester .039 uf 5% 50V		946-026745-393
Capacitor	Metal Polyester .0033 uf 5% 50V		946-026745-332
Capacitor	Metal Polyester .033 uf 5% 50V		946-026745-333
Capacitor	Metal Polyester .047 uf 5% 50V		946-026745-473
Capacitor	Metal Polyester .0047 uf 5% 50V		946-026745-472
Capacitor	Metal Polyester .015 uf 5% 50V		946-026745-513
Capacitor	Metal Polyester .056 uf 5% 50V		946-026745-563
Capacitor	Metal Polyester .068 uf 5% 50V		946-026745-683

PARTS LIST

UPPER FLUTE & SYMPHONIC STRING FILTER BOARD ASSEMBLY (Continued)

Part	Description	Schematic Reference	Part Number
Capacitor	Metal Polyester .0068 uf 5% 50V		946-026745-682
Capacitor	Metal Polyester .075 uf 5% 50V		946-026745-753
Capacitor	Metal Polyester .0082 uf 5% 50V		946-026745-822
Capacitor	Metal Polyester .014 uf 5% 50V		946-026745-143
Capacitor	Metal Polyester .0056 uf 5% 50V		946-026745-562
Capacitor	Polystyrene .22 uf 10% 50V		946-026037-224
Capacitor	Polystyrene .1 uf 10% 50V		946-026037-104
Capacitor	Polystyrene .068 uf 10% 50V		946-026037-683
Capacitor	Polystyrene .047 uf 10% 50V		946-026037-473
Capacitor	Polystyrene .0047 uf 10% 50V		946-026037-472
Capacitor	Polystyrene .0082 uf 10% 50V		946-026037-822
Capacitor	Polystyrene .01 uf 10% 50V		946-026037-103
Capacitor	Polystyrene .022 uf 10% 50V		946-026037-223
Capacitor	Polystyrene .0039 uf 10% 50V		946-026037-392
Capacitor	Polystyrene .039 uf 10% 50V		946-026037-393
Capacitor	Polystyrene .0047 uf 10% 50V		946-026037-472
Capacitor	Polystyrene .047 uf 10% 50V		946-026037-473
Capacitor	Polystyrene .0068 uf 10% 50V		946-026037-682
Capacitor	Tantalum 5.6 uf 25V		946-021452-001
Diode		All	919-024769
IC	Quad Op-Amp	IC25-34	991-024103
IC	Quad Op-Amp	IC35, 36	991-025267
Network	Reed String		949-024537
Photocell		P1	948-022782
Socket	14-Pin		906-018905
Transistor	FET Audio Switch	IC70-77, 116-118	991-022774

UPPER KEYING CONTROL & AOC BOARD ASSEMBLY

Part	Description	Schematic Reference	Part Number
Capacitor	Electrolytic 40 uf 25V Dual		945-022781-001
Diode		All	919-024769
Potentiometer	5K 20% AOC Range Adjustment	VR33	925-004349-005
Transistor	NPN AOC Range Regulator	Q242	991-020425-001
Transistor	PNP Driver Enable	Q243	991-020426-003
Transistor	NPN Golden Harp Enable Switcher	Q244	991-002232
Transistor	NPN	Q245,247,249,251,253, 255,257,259,261,263, 265,267	991-008393
Transistor	PNP	All others	991-010098

UPPER/LOWER KEYSWITCH ASSEMBLY

Part	Description	Schematic Reference	Part Number
Actuator	Keyswitch		964-024116
Coil	70 uh	L3,6,7,10,16,17	956-018877
Diode		All	919-024769
Spring	Pulldown		975-007085

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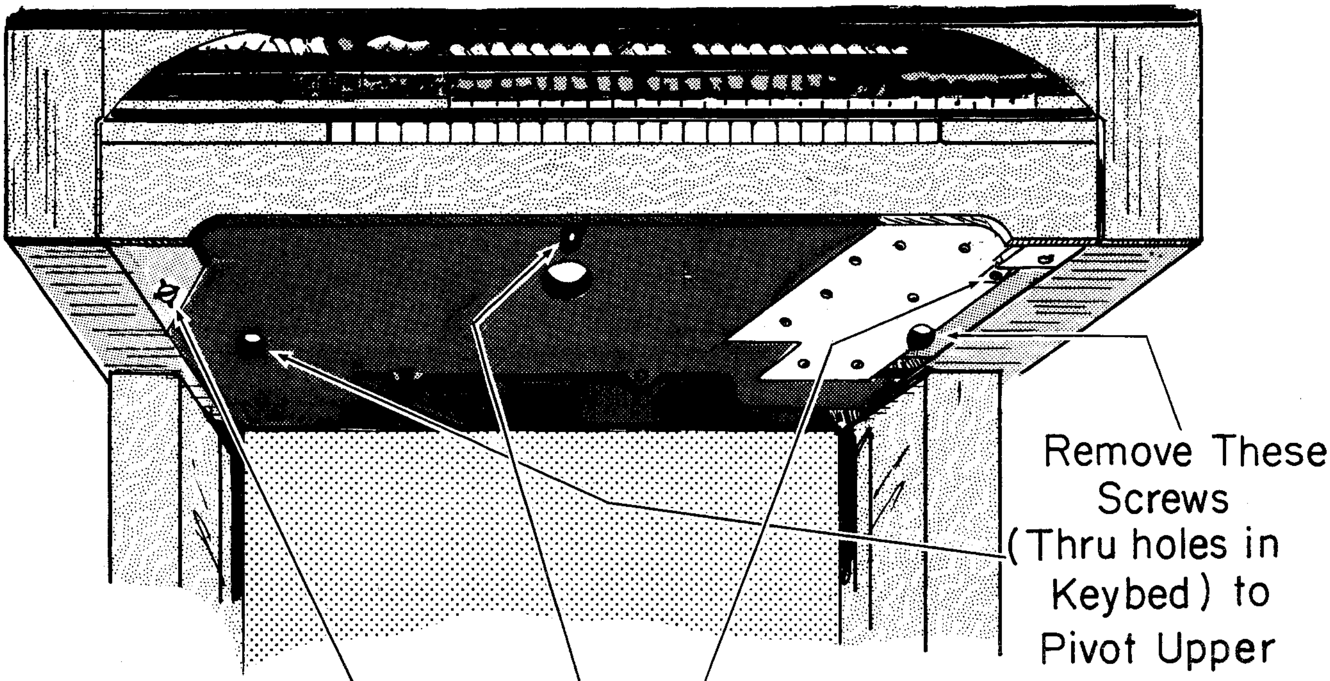
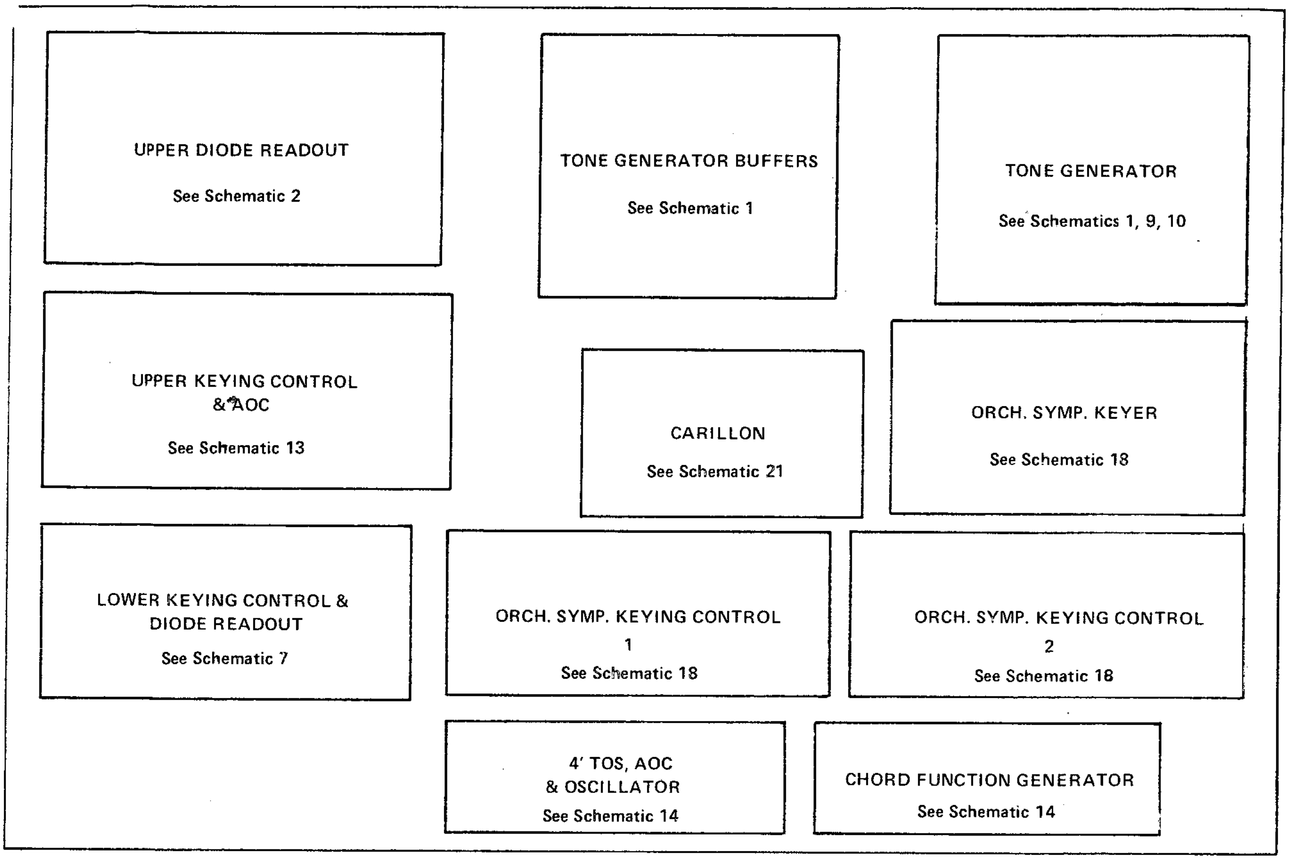
IMPORTANT: Before Printed Circuit Board Trays can be Lowered or Upper Manual can be Pivoted Upward Tray Assembly must be Slid Back


Remove These Screws (Thru holes in Keybed) to Pivot Upper Manual
Remove These Screws To Slide Tray Assembly


UPPER DIODE READOUT
See Schematic 2
TONE GENERATOR BUFFERS
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TONE GENERATOR
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UPPER KEYING CONTROL & AOC
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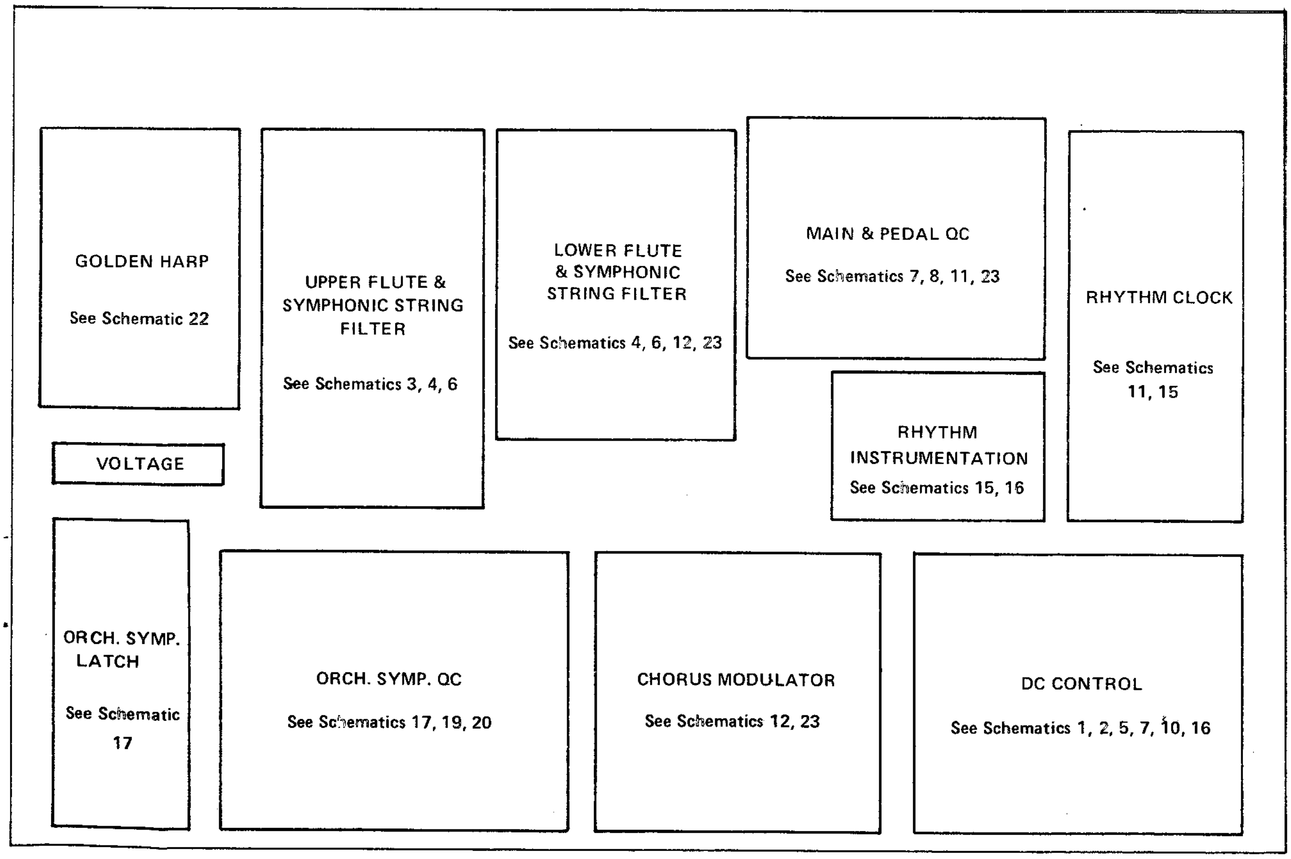
See Schematic 14

TRAY UP

TRAY DOWN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UPPER FLUTE & SYMPHONIC STRING FILTER
See Schematics 3, 4, 6
LOWER FLUTE & SYMPHONIC STRING FILTER
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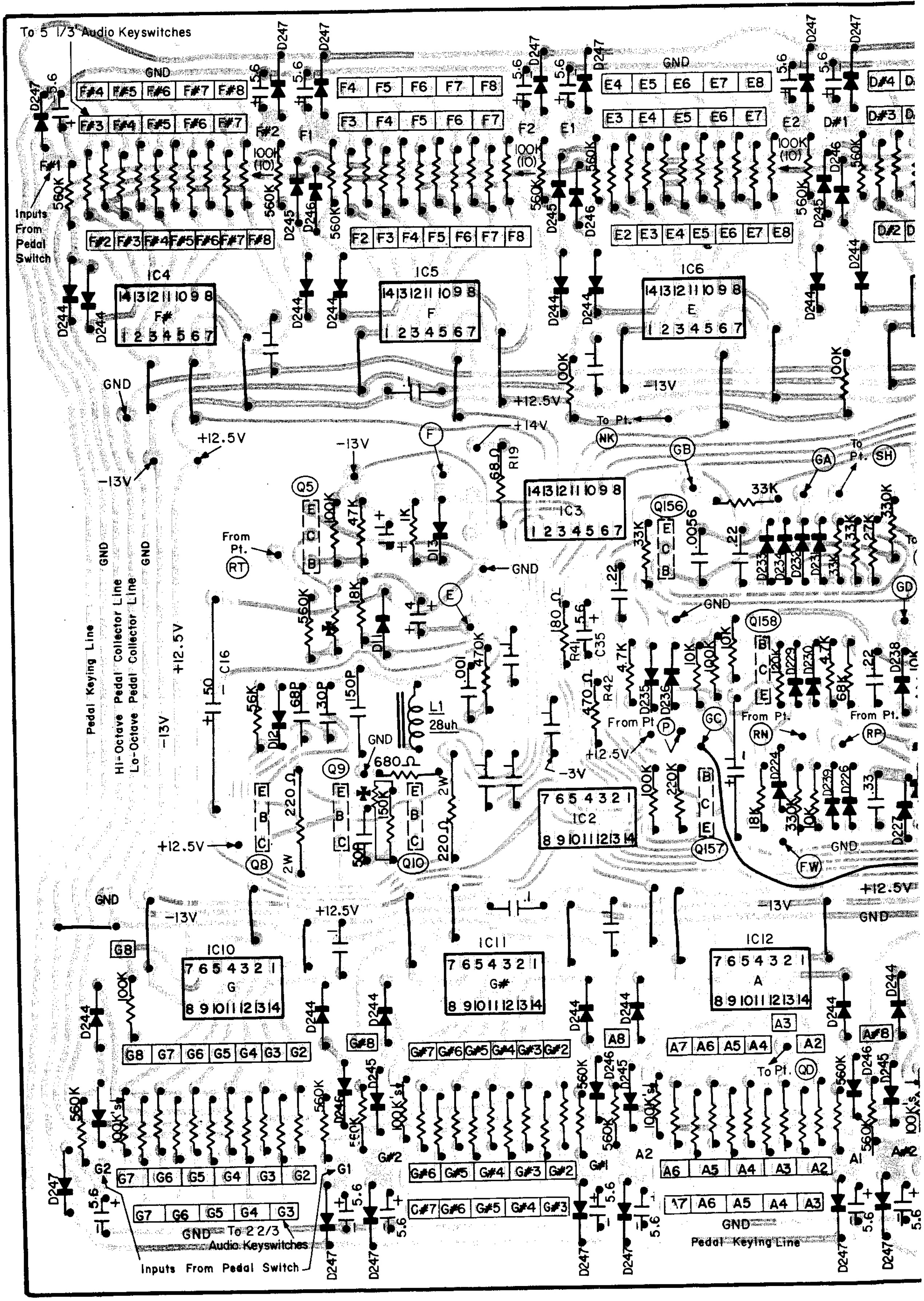
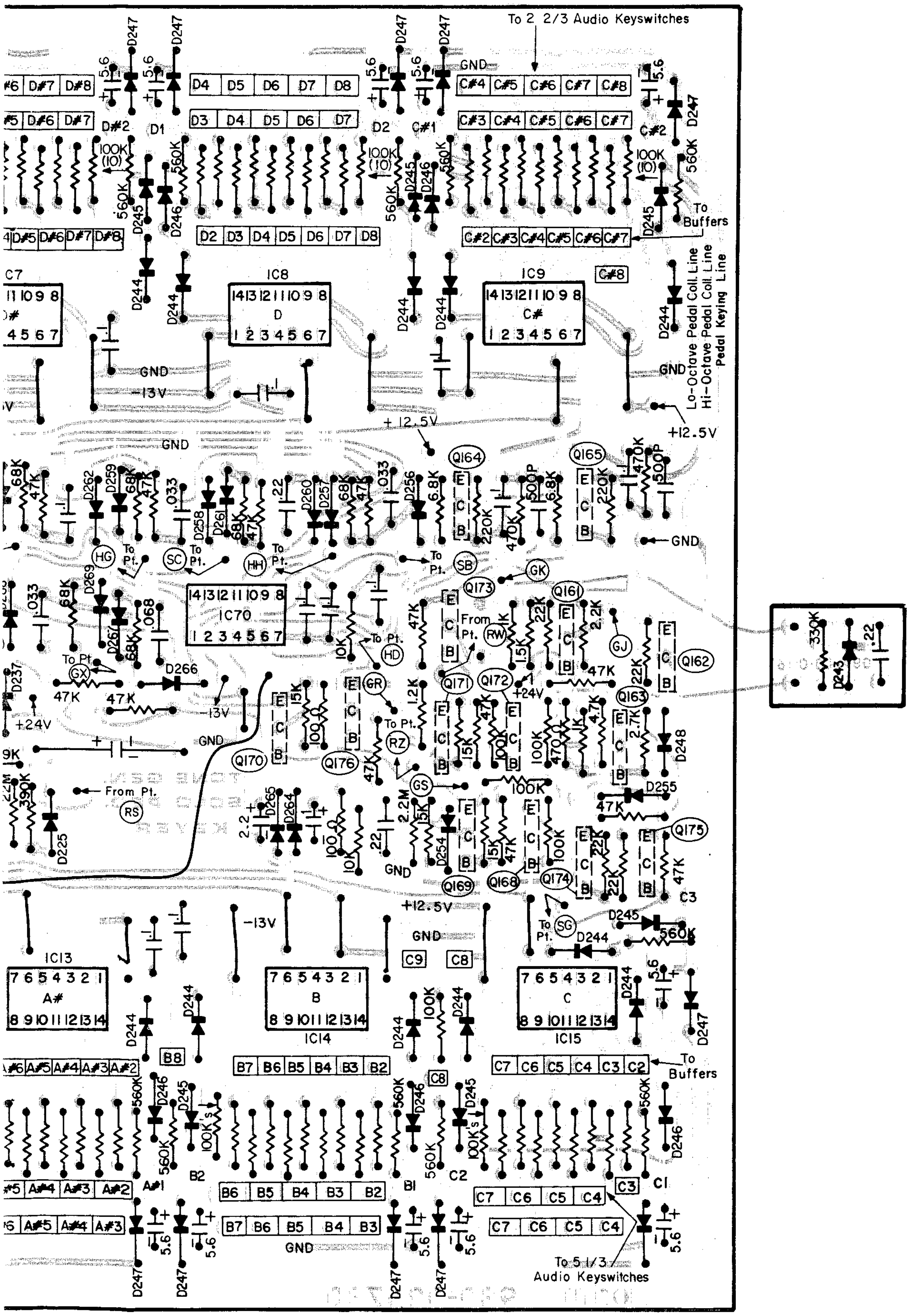
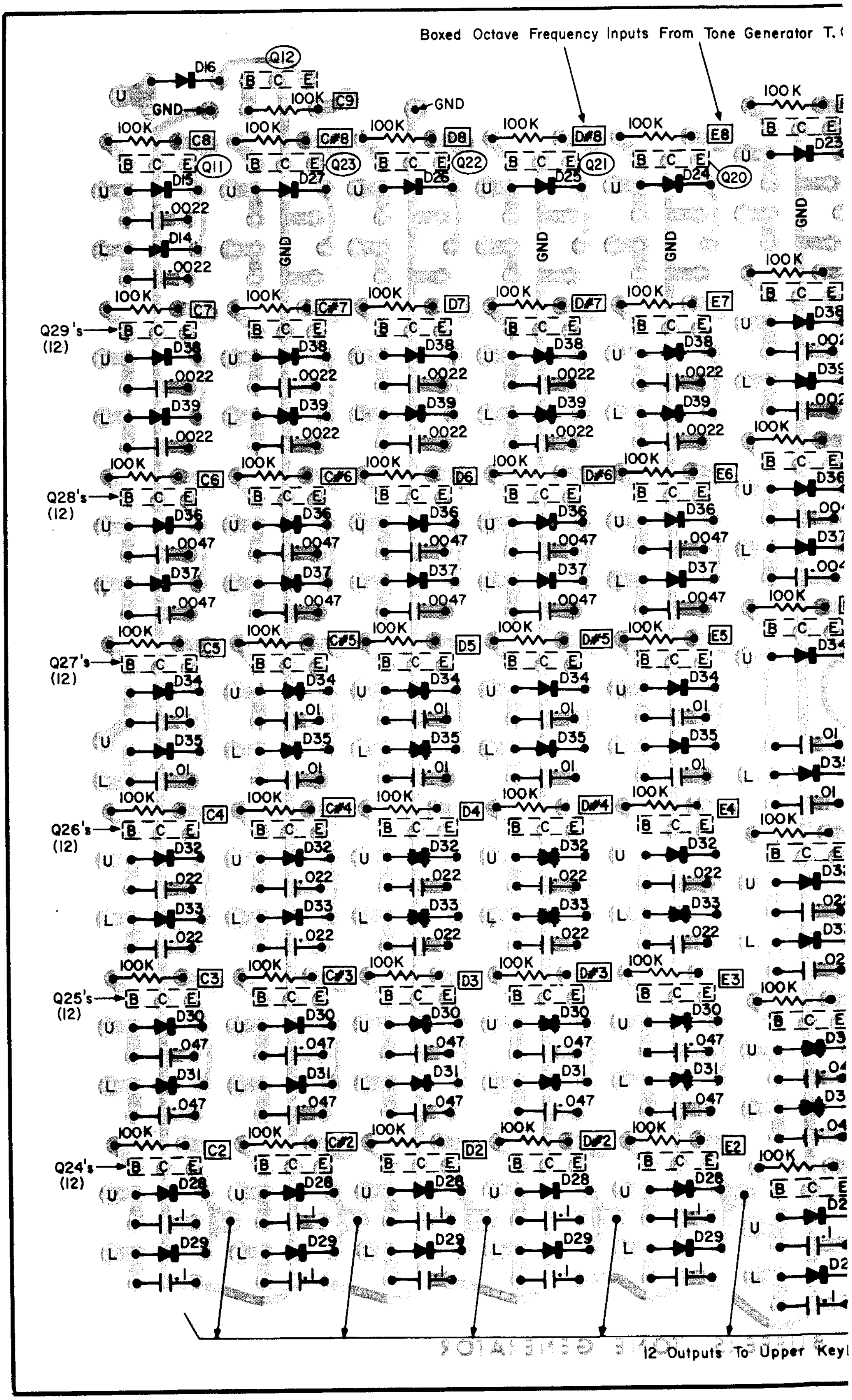

To 5 1/3 Audio Keyswitches
GND
F#4 F#5 F#6 F#7 F#8
F#3 F#4 F#5 F#6 F#7
F#1
Inputs From Pedal Switch
560K
F#2 F#3 F#4 F#5 F#6 F#7 F#8
IC4
14 13 12 11 10 9 8
F#
1 2 3 4 5 6 7
D244
D247
5.6
F#2
F1
100K (10)
560K
D245
D246
F4 F5 F6 F7 F8
F3 F4 F5 F6 F7
F2 F3 F4 F5 F6 F7 F8
IC5
F
F2
E1
E4 E5 E6 E7 E8
E3 E4 E5 E6 E7
E2 E3 E4 E5 E6 E7 E8
IC6
E
E2
D#1
D#4
D#3
D#2
GND
+12.5V
-13V
-13V
+12.5V
+14V
To Pt. NK
F
R19
68Ω
GB
GA
To Pt. SH
33K
330K
Q5
E C B
100K
47K
1K
D13
From Pt. RT
GND
IC3
Q156
.0056
.22
D233
D234
D232
D231
33K
27K
GD
GND
Pedal Keying Line
Hi-Octave Pedal Collector Line
Lo-Octave Pedal Collector Line
GND
GND
+12.5V
-13V
C16
.50
560K
18K
D11
4
E
470K
.001
180Ω
R41
5.6
C35
4.7K
470Ω
R42
D235
D236
10K
Q158
120K
D229
D230
4.7K
68K
.22
D238
From Pt. RN
From Pt. RP
56K
D12
68P
130P
150P
L1
28uh
GND
680Ω
Q9
150K
2W
220Ω
Q8
Q10
50P
+12.5V
-3V
From Pt. P
GC
+12.5V
IC2
7 6 5 4 3 2 1
8 9 10 11 12 13 14
100K
220K
Q157
18K
D224
330K
D239
D226
.33
D227
FW
GND
+12.5V
GND
-13V
-13V
+12.5V
G8
IC10
7 6 5 4 3 2 1
G
8 9 10 11 12 13 14
IC11
G#
IC12
A
G8 G7 G6 G5 G4 G3 G2
G#8
G#7 G#6 G#5 G#4 G#3 G#2
A8
A3
A7 A6 A5 A4
A2
A#8
To Pt. QD
100K's
560K
G2
G7 G6 G5 G4 G3 G2
G7 G6 G5 G4 G3
G1
G#2
G#6 G#5 G#4 G#3 G#2
C#7 G#6 G#5 G#4 G#3
G#1
A2
A6 A5 A4 A3 A2
A7 A6 A5 A4 A3
A1
A#2
GND
To 2 2/3 Audio Keyswitches
Inputs From Pedal Switch
GND
Pedal Keying Line



To 2 2/3 Audio Keyswitches
D#6 D#7 D#8
D#5 D#6 D#7
D4 D5 D6 D7 D8
D3 D4 D5 D6 D7
C#4 C#5 C#6 C#7 C#8
C#3 C#4 C#5 C#6 C#7
D#2
D1
D2
C#1
C#2
GND
5.6
D247
D245
D246
D244
100K (10)
560K
D#4 D#5 D#6 D#7 D#8
D2 D3 D4 D5 D6 D7 D8
C#2 C#3 C#4 C#5 C#6 C#7
To Buffers
IC8
D
IC9
C#
C#8
Lo-Octave Pedal Coll. Line
Hi-Octave Pedal Coll. Line
Pedal Keying Line
GND
-13V
+12.5V
Q164
Q165
Q161
Q162
Q163
Q168
Q169
Q170
Q171
Q172
Q173
Q174
Q175
Q176
IC70
To Pt.
From Pt.
HG
SC
HH
SB
GK
RW
GJ
HD
GX
GR
RZ
GS
RS
SG
D225
D237
D243
D248
D254
D255
D256
D257
D258
D259
D260
D261
D262
D264
D265
D266
D267
D269
+24V
47K
68K
100K
15K
22K
2.2K
2.7K
470K
500P
220K
6.8K
330K
.033
.068
.22
2.2M
100 Ω
470 Ω
C3
IC13
A#
IC14
B
IC15
C
C9
C8
B8
A#6 A#5 A#4 A#3 A#2
B7 B6 B5 B4 B3 B2
C7 C6 C5 C4 C3 C2
100K's
A#1
B2
B1
C2
C1
A#5 A#4 A#3 A#2
B6 B5 B4 B3 B2
C7 C6 C5 C4
A#6 A#5 A#4 A#3
B7 B6 B5 B4 B3
C7 C6 C5 C4
To 5 1/3 Audio Keyswitches



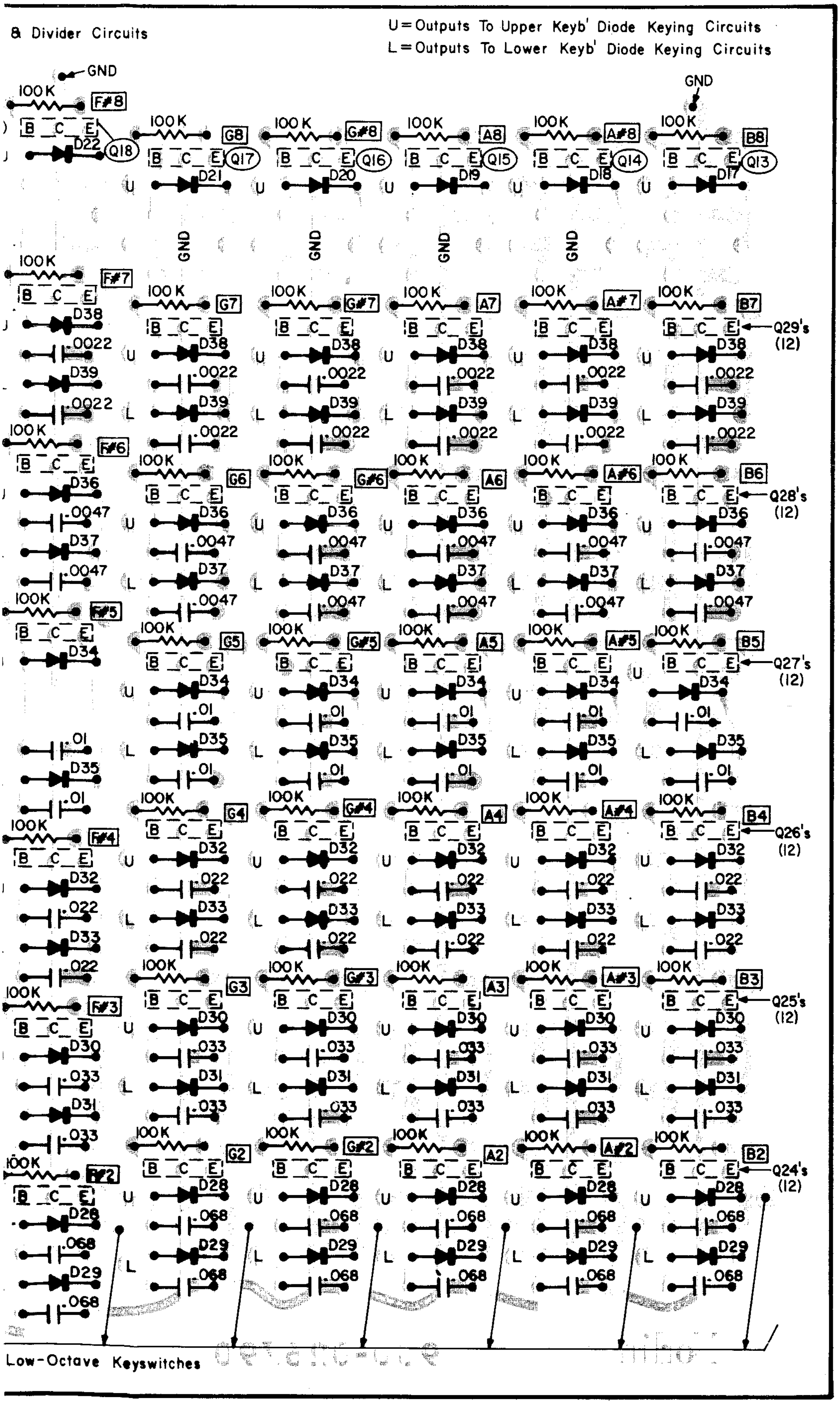
Boxed Octave Frequency Inputs From Tone Generator T.

12 Outputs To Upper Keyb

Q12
D16
GND
100K
C9
Q11
Q23
Q22
Q21
Q20
C8
C#8
D8
D#8
E8
D15
D27
D26
D25
D24
D23
.0022
D14
C7
C#7
D7
D#7
E7
Q29's (12)
D38
D39
C6
C#6
D6
D#6
E6
Q28's (12)
D36
D37
.0047
C5
C#5
D5
D#5
E5
Q27's (12)
D34
D35
.01
C4
C#4
D4
D#4
E4
Q26's (12)
D32
D33
.022
C3
C#3
D3
D#3
E3
Q25's (12)
D30
D31
.047
C2
C#2
D2
D#2
E2
Q24's (12)
D28
D29
.1
B C E
U
L

BUFFER BOARD

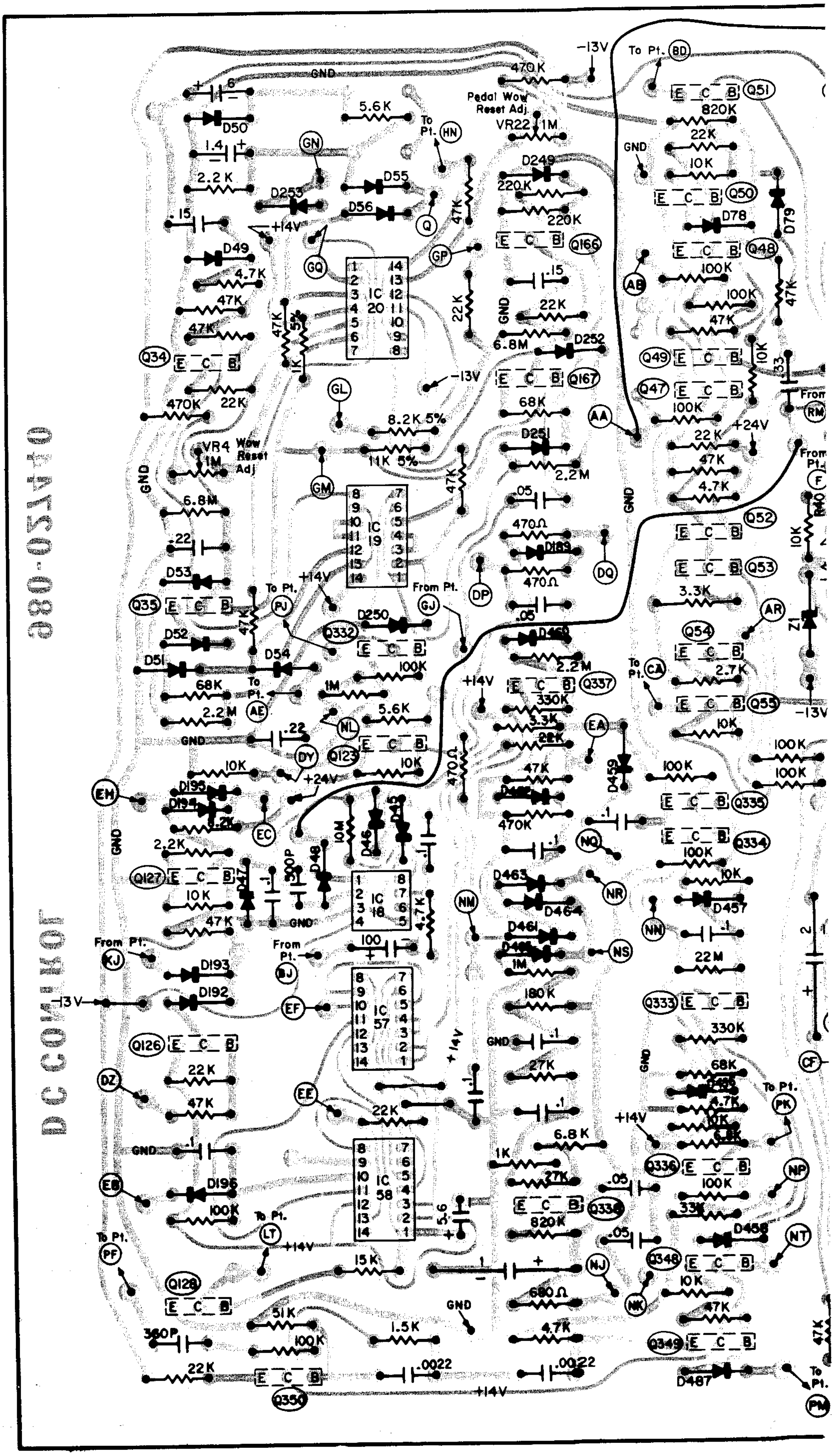
& Divider Circuits



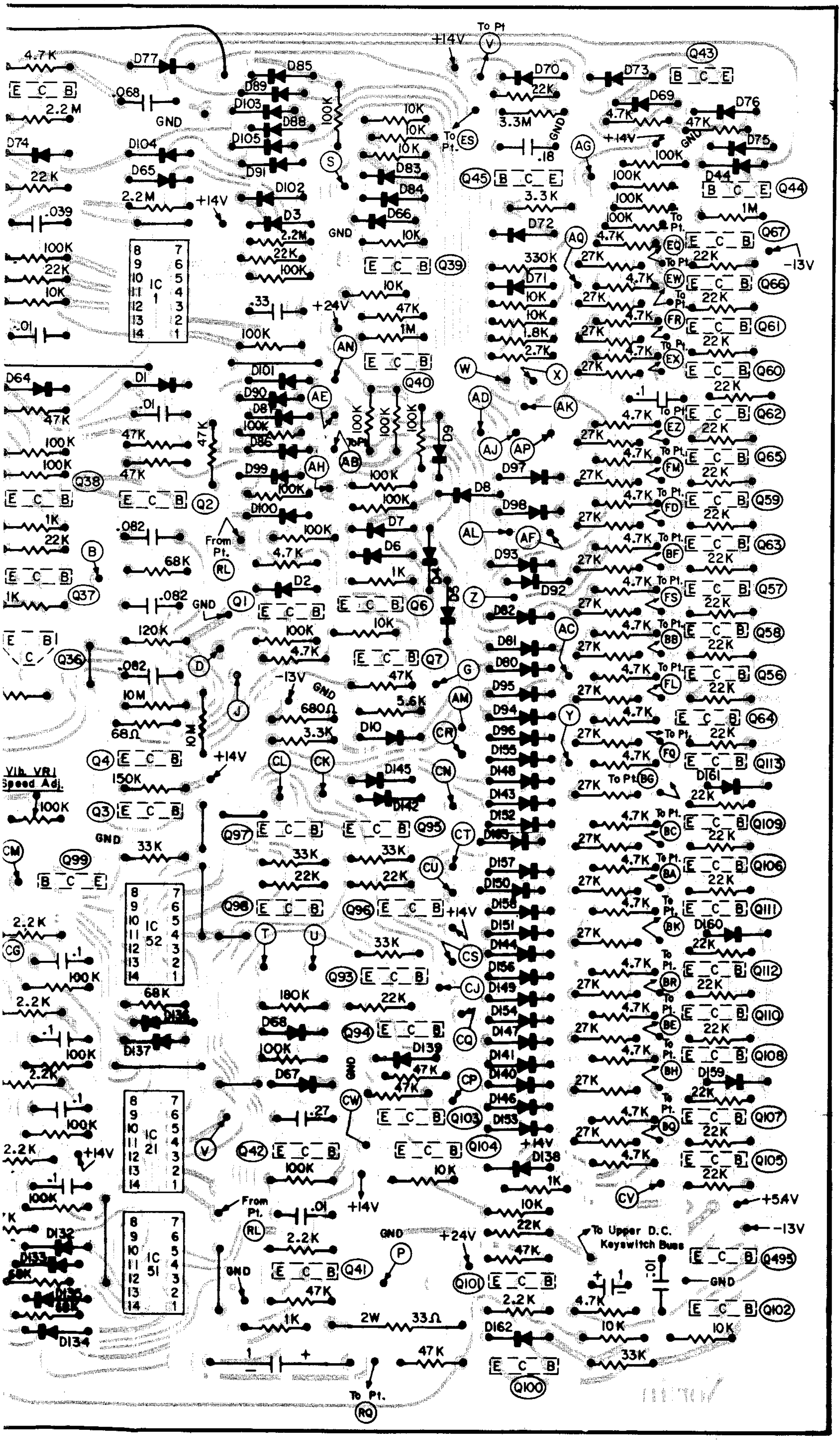
U=Outputs To Upper Keyb' Diode Keying Circuits

L=Outputs To Lower Keyb' Diode Keying Circuits

GND
100K
F#8
G8
G#8
A8
A#8
B8
B
C
E
Q18
Q17
Q16
Q15
Q14
Q13
D22
D21
D20
D19
D18
D17
U
L
F#7
G7
G#7
A7
A#7
B7
Q29's (12)
D38
D39
.0022
F#6
G6
G#6
A6
A#6
B6
Q28's (12)
D36
D37
.0047
F#5
G5
G#5
A5
A#5
B5
Q27's (12)
D34
D35
.01
F#4
G4
G#4
A4
A#4
B4
Q26's (12)
D32
D33
.022
F#3
G3
G#3
A3
A#3
B3
Q25's (12)
D30
D31
.033
F#2
G2
G#2
A2
A#2
B2
Q24's (12)
D28
D29
.068
Low-Octave Keyswitches


DC COMMON
041-650-086
-13V
To Pt. BD
470K
Pedal Wow Reset Adj.
VR22 1M
Q51
820K
22K
GND
10K
Q50
D79
D78
Q48
AB
100K
47K
Q49
Q47
10K
33
From RM
+24V
From Pt. F
R40
Q52
Q53
3.3K
AR
Z1
Q54
To Pt. CA
2.7K
Q55
-13V
Q335
Q334
NQ
NR
D457
NN
22M
Q333
330K
68K
D455
To Pt. PK
4.7K
6.8K
+14V
Q336
NP
33K
D458
NT
Q348
NK
NJ
Q349
D487
To Pt. PM
GND
6
D50
1.4
2.2K
.15
D49
4.7K
47K
Q34
470K
VR4 1M
Wow Reset Adj.
6.8M
.22
D53
Q35
D52
D51
68K
2.2M
EH
D195
D194
1.2K
2.2K
Q127
From Pt. KJ
D193
D192
-13V
Q126
DZ
22K
EB
D196
100K
To Pt. PF
Q128
360P
51K
22K
Q350
5.6K
To Pt. HN
GN
D253
D55
D56
+14V
Q
GQ
GP
IC 20
47K
5%
1K
GL
8.2K 5%
11K 5%
GM
IC 19
To Pt. PJ
Q332
D250
D54
To Pt. AE
1M
NL
DY
Q123
+24V
EC
D47
D48
300P
10M
D46
D45
IC 18
100
From Pt. BJ
EF
IC 57
EE
IC 58
To Pt. LT
15K
1.5K
.0022
D249
220K
Q166
D252
Q167
D251
.05
470Ω
D189
DQ
DP
From Pt. GJ
D460
Q337
330K
EA
D459
D462
470K
D463
D464
NM
D461
D465
NS
180K
27K
1K
820K
Q338
680Ω
AA

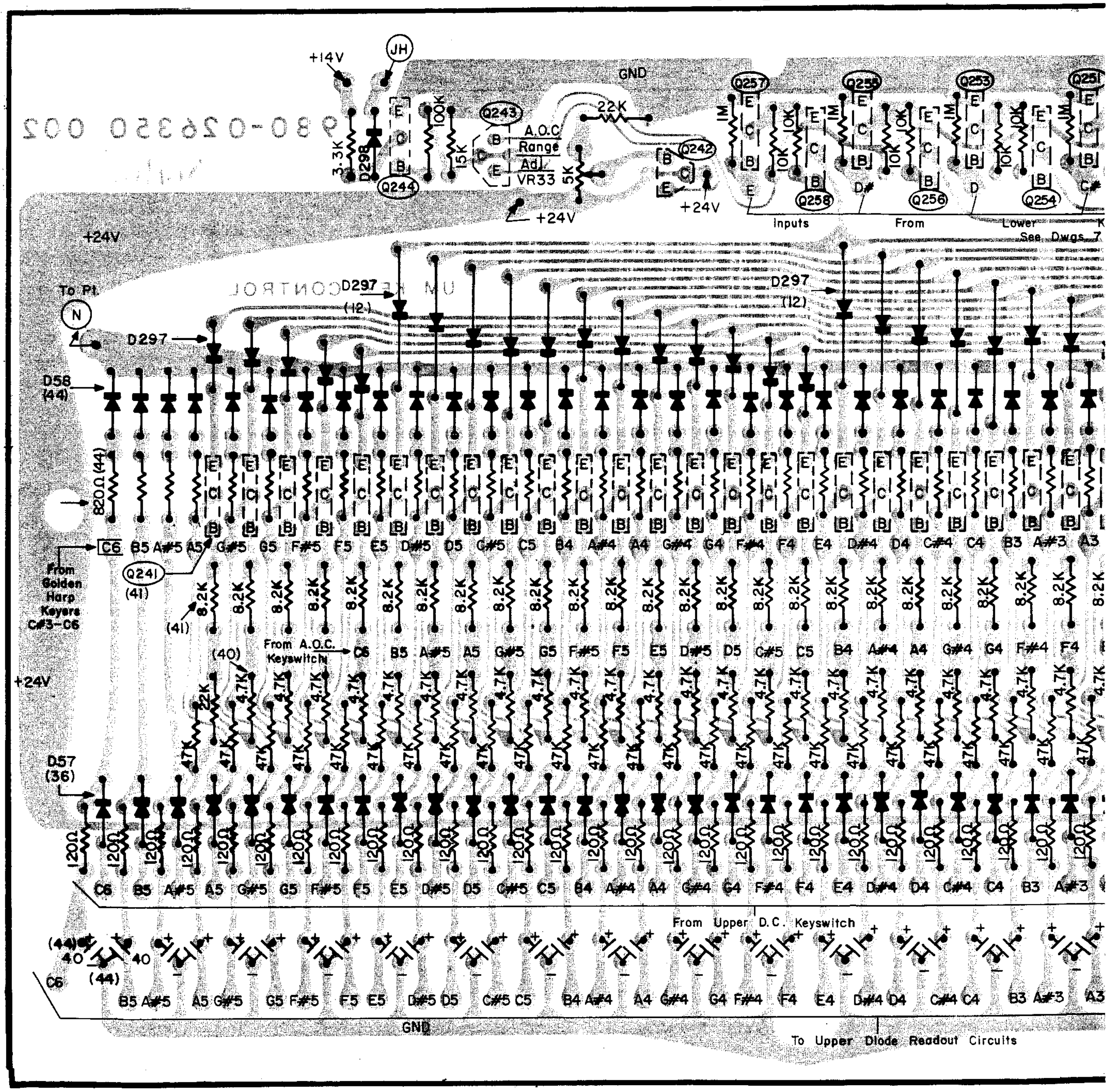
CONTROL BD.



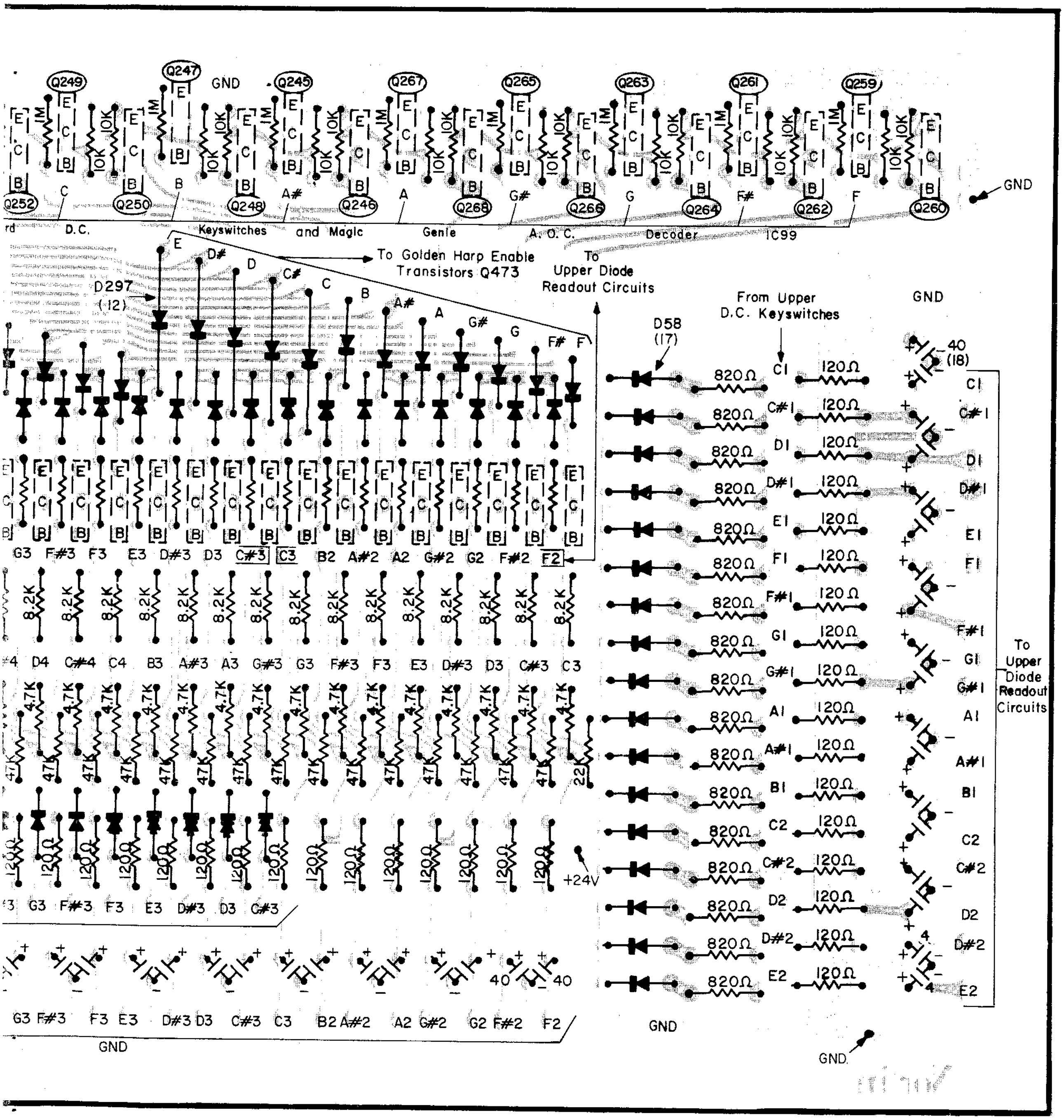
To Pt.
V
+14V
D77
D85
D89
D103
D88
D105
D91
D102
D3
D70
22K
3.3M
D73
Q43
B C E
D69
D76
4.7K
47K
D75
100K
AG
GND
.18
Q45
Q44
D44
1M
3.3K
D72
AQ
EQ
Q67
-13V
330K
D71
10K
1.8K
2.7K
27K
EW
Q66
FR
Q61
EX
Q60
W
X
AK
AD
AJ
AP
D97
D98
D93
D92
AF
AL
Z
D82
AC
D81
D80
D95
D94
D96
D155
D148
D143
D152
D157
D150
D158
D151
D144
D156
D149
D154
D147
D141
D140
D146
D153
D138
EZ
Q62
FM
Q65
FD
Q59
BF
Q63
FS
Q57
BB
Q58
FL
Q56
Y
Q64
FQ
Q113
BG
D161
BC
Q109
BA
Q106
BK
Q111
D160
BR
Q112
BE
Q110
BH
Q108
D159
BQ
Q107
Q105
CV
+54V
To Upper D.C. Keyswitch Buss
Q495
Q102
GND
4.7K
10K
33K
Q100
D162
2.2K
Q101
+24V
P
2W
33Ω
47K
1K
RQ
Q41
RL
From Pt.
.01
+14V
Q42
Q104
Q103
CW
CP
CQ
CJ
CS
CU
CT
Q93
Q94
D139
D68
D67
180K
.27
Q96
Q98
T
U
Q97
Q95
CL
CK
CN
CR
AM
D145
D142
D10
5.6K
3.3K
680Ω
Q7
G
Q6
Q1
D2
D6
D7
D8
D9
D99
D100
D86
D87
D90
D101
AE
AH
AB
AN
Q40
Q39
D66
D84
D83
S
ES
100K
+24V
.33
47K
1M
IC 1
IC 52
IC 21
IC 51
8 9 10 11 12 13 14
7 6 5 4 3 2 1
4.7K
D74
D104
D65
2.2M
.039
22K
.01
D64
D1
Q38
Q2
Q37
B
68K
.082
Q36
D
J
10M
68Ω
Q4
Q3
Vib. VR1 Speed Adj.
150K
CM
Q99
CG
2.2K
D137
D136
D132
D133
D135
D134
E C B

9

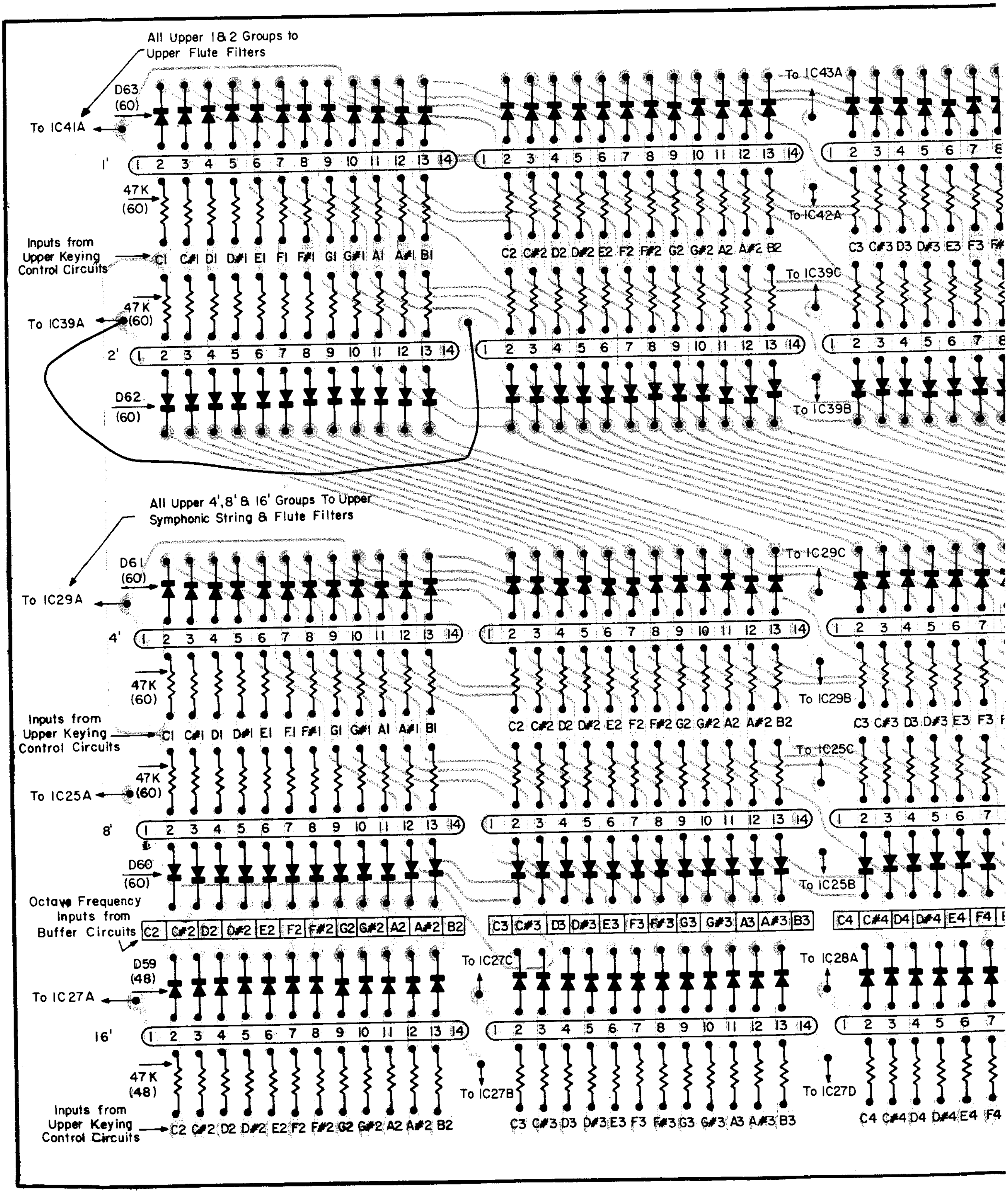
UPPER KEYING CONTROL


+14V
JH
GND
Q257
Q255
Q253
Q251
Q243
A.O.C
Range
Adj
VR33
22K
Q242
3.3K
D298
100K
15K
5K
Q244
+24V
1M
10K
Q258
Q256
Q254
E
D#
D
C#
Inputs
From
Lower
See Dwgs. 7
+24V
To Pt.
N
D297
(12)
D297
D58
(44)
820Ω (44)
C6
B5
A#5
A5
G#5
G5
F#5
F5
E5
D#5
D5
C#5
C5
B4
A#4
A4
G#4
G4
F#4
F4
E4
D#4
D4
C#4
C4
B3
A#3
A3
From Golden Harp Keyers C#3-C6
Q241
(41)
(41)
8.2K
(40)
From A.O.C. Keyswitch
22K
4.7K
47K
D57
(36)
120Ω
From Upper D.C. Keyswitch
(44)
40
40
(44)
GND
To Upper Diode Readout Circuits

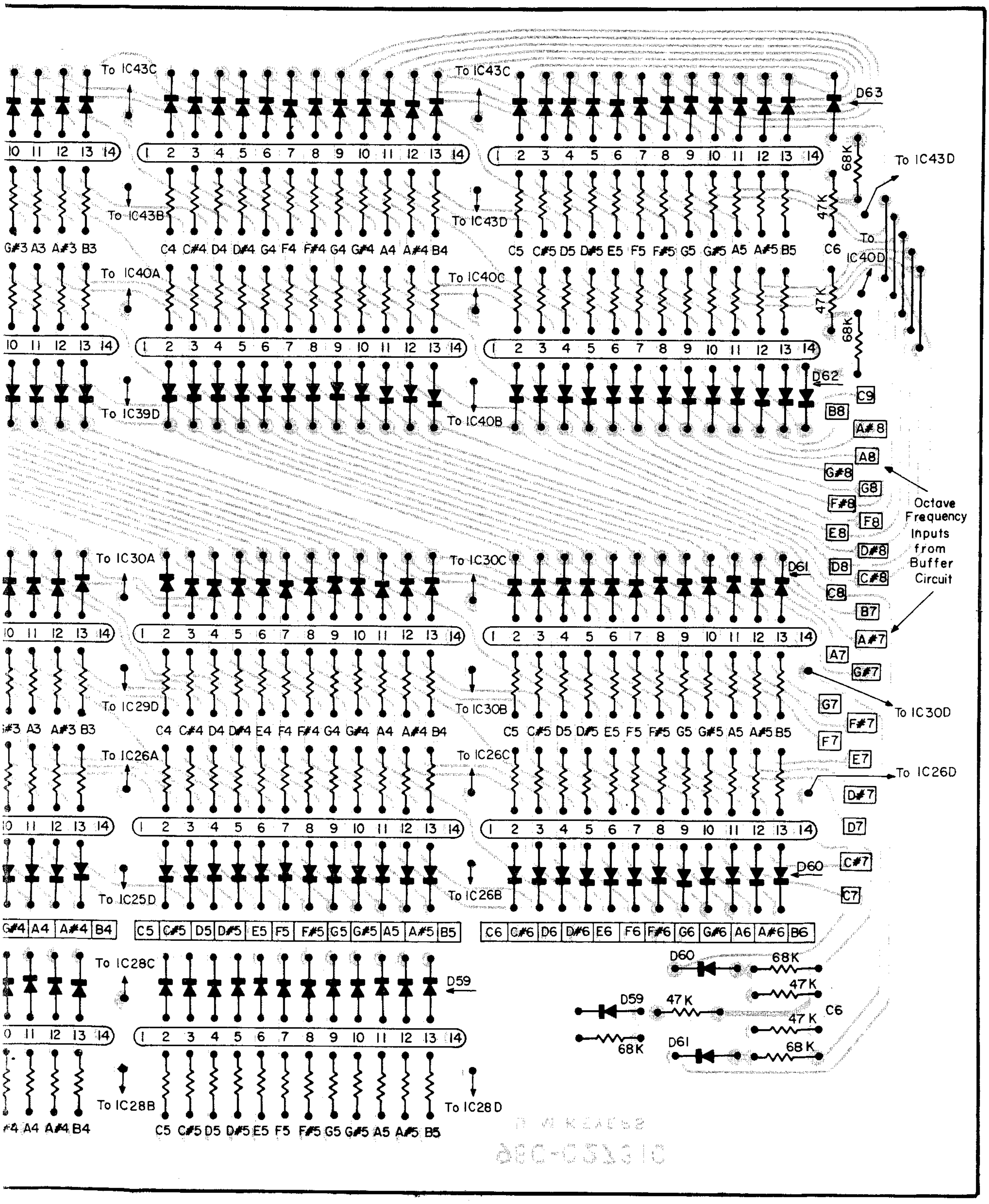
& A.O.C. BOARD


Q249
Q247
GND
Q245
Q267
Q265
Q263
Q261
Q259
Q252
Q250
Q248
Q246
Q268
Q266
Q264
Q262
Q260
1M
10K
E
C
B
C
B
A#
A
G#
G
F#
F
GND
D.C. Keyswitches and Magic Genie A.O.C. Decoder IC99
E
D#
D
C#
C
B
A#
A
G#
G
F#
F
To Golden Harp Enable Transistors Q473
To Upper Diode Readout Circuits
D297 (12)
D58 (17)
From Upper D.C. Keyswitches
GND
G3 F#3 F3 E3 D#3 D3 C#3 C3 B2 A#2 A2 G#2 G2 F#2 F2
8.2K
D4 C#4 C4 B3 A#3 A3 G#3 G3 F#3 F3 E3 D#3 D3 C#3 C3
4.7K
47K
22
120Ω
+24V
G3 F#3 F3 E3 D#3 D3 C#3
40
G3 F#3 F3 E3 D#3 D3 C#3 C3 B2 A#2 A2 G#2 G2 F#2 F2
GND
820Ω
120Ω
C1 C#1 D1 D#1 E1 F1 F#1 G1 G#1 A1 A#1 B1 C2 C#2 D2 D#2 E2
40 (18)
4
To Upper Diode Readout Circuits
GND
GND

UPPER DIODE

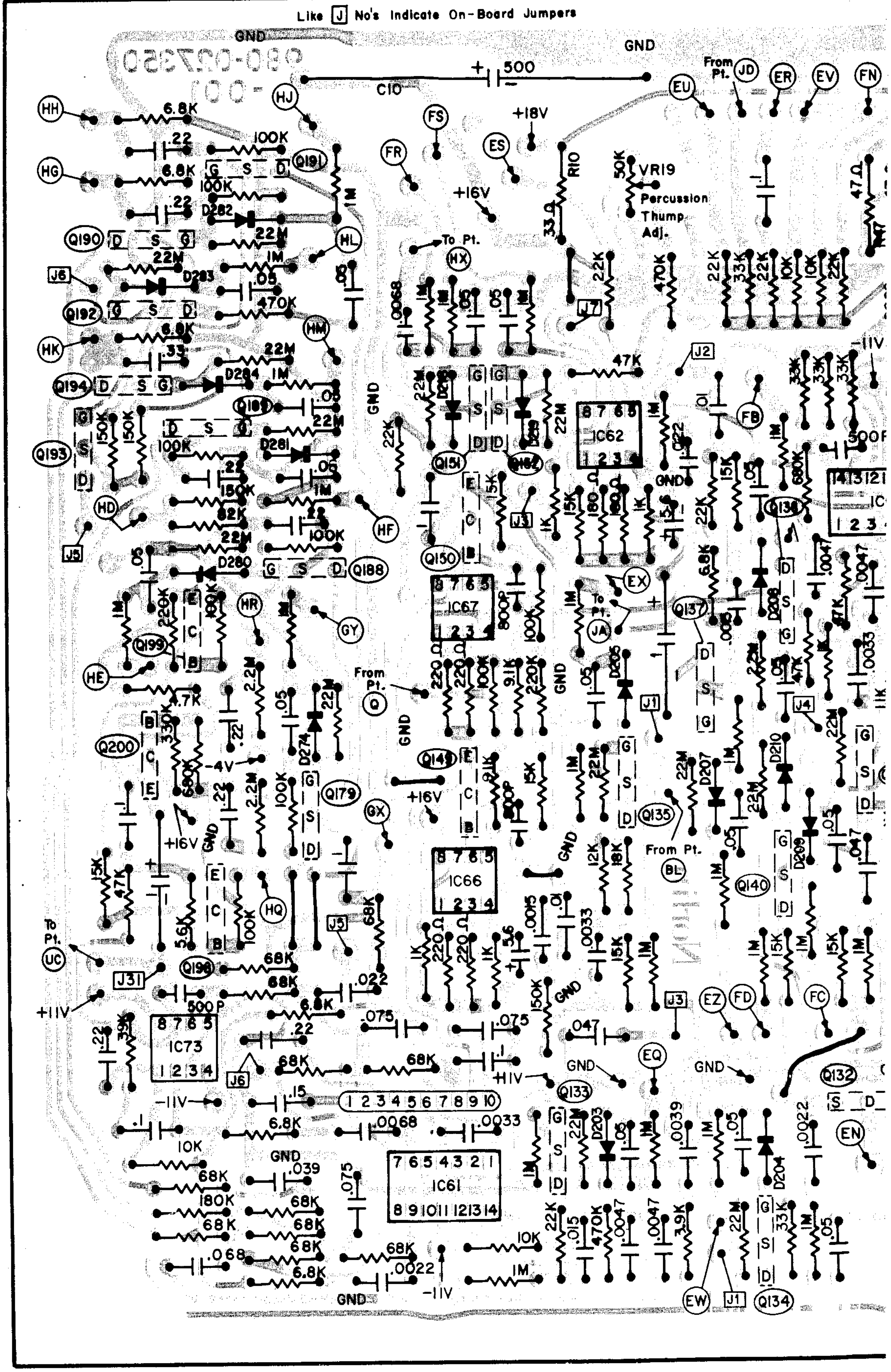

All Upper 1 & 2 Groups to Upper Flute Filters
D63 (60)
To IC41A
1'
47K (60)
Inputs from Upper Keying Control Circuits
C1 C#1 D1 D#1 E1 F1 F#1 G1 G#1 A1 A#1 B1
C2 C#2 D2 D#2 E2 F2 F#2 G2 G#2 A2 A#2 B2
C3 C#3 D3 D#3 E3 F3 F#
To IC43A
To IC42A
To IC39C
To IC39A
47K (60)
2'
D62 (60)
To IC39B
1 2 3 4 5 6 7 8 9 10 11 12 13 14
All Upper 4', 8' & 16' Groups To Upper Symphonic String & Flute Filters
D61 (60)
To IC29A
4'
47K (60)
To IC29C
To IC29B
Inputs from Upper Keying Control Circuits
C1 C#1 D1 D#1 E1 F1 F#1 G1 G#1 A1 A#1 B1
C2 C#2 D2 D#2 E2 F2 F#2 G2 G#2 A2 A#2 B2
C3 C#3 D3 D#3 E3 F3
47K (60)
To IC25A
To IC25C
8'
D60 (60)
To IC25B
Octave Frequency Inputs from Buffer Circuits
C2 C#2 D2 D#2 E2 F2 F#2 G2 G#2 A2 A#2 B2
C3 C#3 D3 D#3 E3 F3 F#3 G3 G#3 A3 A#3 B3
C4 C#4 D4 D#4 E4 F4
D59 (48)
To IC27A
To IC27C
To IC28A
16'
47K (48)
To IC27B
To IC27D
Inputs from Upper Keying Control Circuits
C2 C#2 D2 D#2 E2 F2 F#2 G2 G#2 A2 A#2 B2
C3 C#3 D3 D#3 E3 F3 F#3 G3 G#3 A3 A#3 B3
C4 C#4 D4 D#4 E4 F4

READOUT BOARD

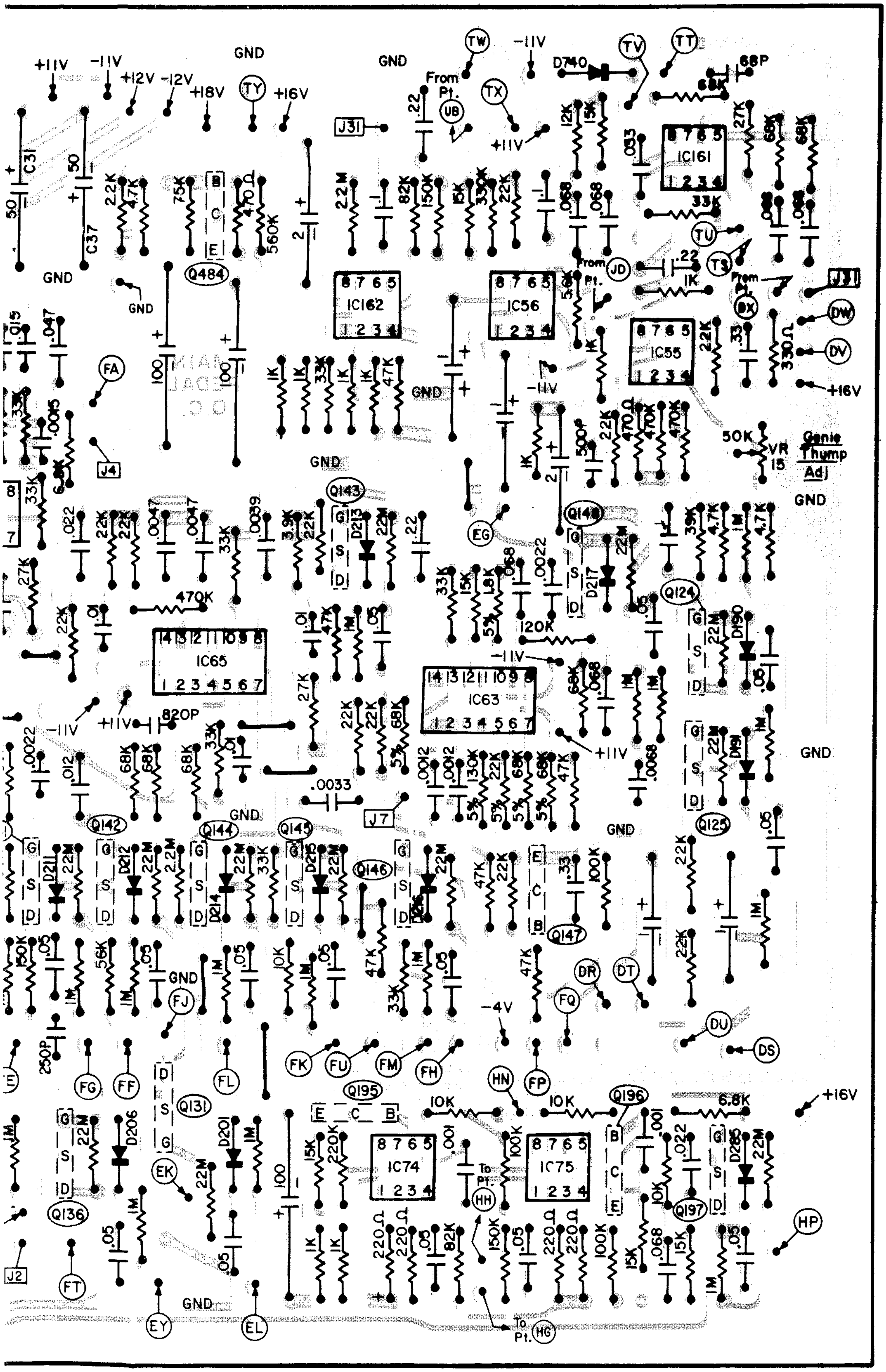


To IC43C
To IC43C
D63
To IC43D
To IC43B
To IC43D
68K
47K
G#3 A3 A#3 B3
C4 C#4 D4 D#4 G4 F4 F#4 G4 G#4 A4 A#4 B4
C5 C#5 D5 D#5 E5 F5 F#5 G5 G#5 A5 A#5 B5
C6
To IC40D
To IC40A
To IC40C
47K
68K
To IC39D
To IC40B
D62
C9
B8
A#8
A8
G#8
G8
F#8
F8
E8
D#8
D8
C#8
C8
B7
A#7
A7
G#7
G7
F#7
F7
E7
D#7
D7
C#7
C7
Octave Frequency Inputs from Buffer Circuit
To IC30A
To IC30C
D61
To IC29D
To IC30B
To IC30D
G#3 A3 A#3 B3
C4 C#4 D4 D#4 E4 F4 F#4 G4 G#4 A4 A#4 B4
C5 C#5 D5 D#5 E5 F5 F#5 G5 G#5 A5 A#5 B5
To IC26A
To IC26C
To IC26D
To IC25D
To IC26B
D60
G#4 A4 A#4 B4
C5 C#5 D5 D#5 E5 F5 F#5 G5 G#5 A5 A#5 B5
C6 C#6 D6 D#6 E6 F6 F#6 G6 G#6 A6 A#6 B6
To IC28C
D59
D60
68K
47K
D59
47K
47K
C6
68K
D61
68K
To IC28B
To IC28D
G#4 A4 A#4 B4
C5 C#5 D5 D#5 E5 F5 F#5 G5 G#5 A5 A#5 B5

Like [J] No's Indicate On-Board Jumpers

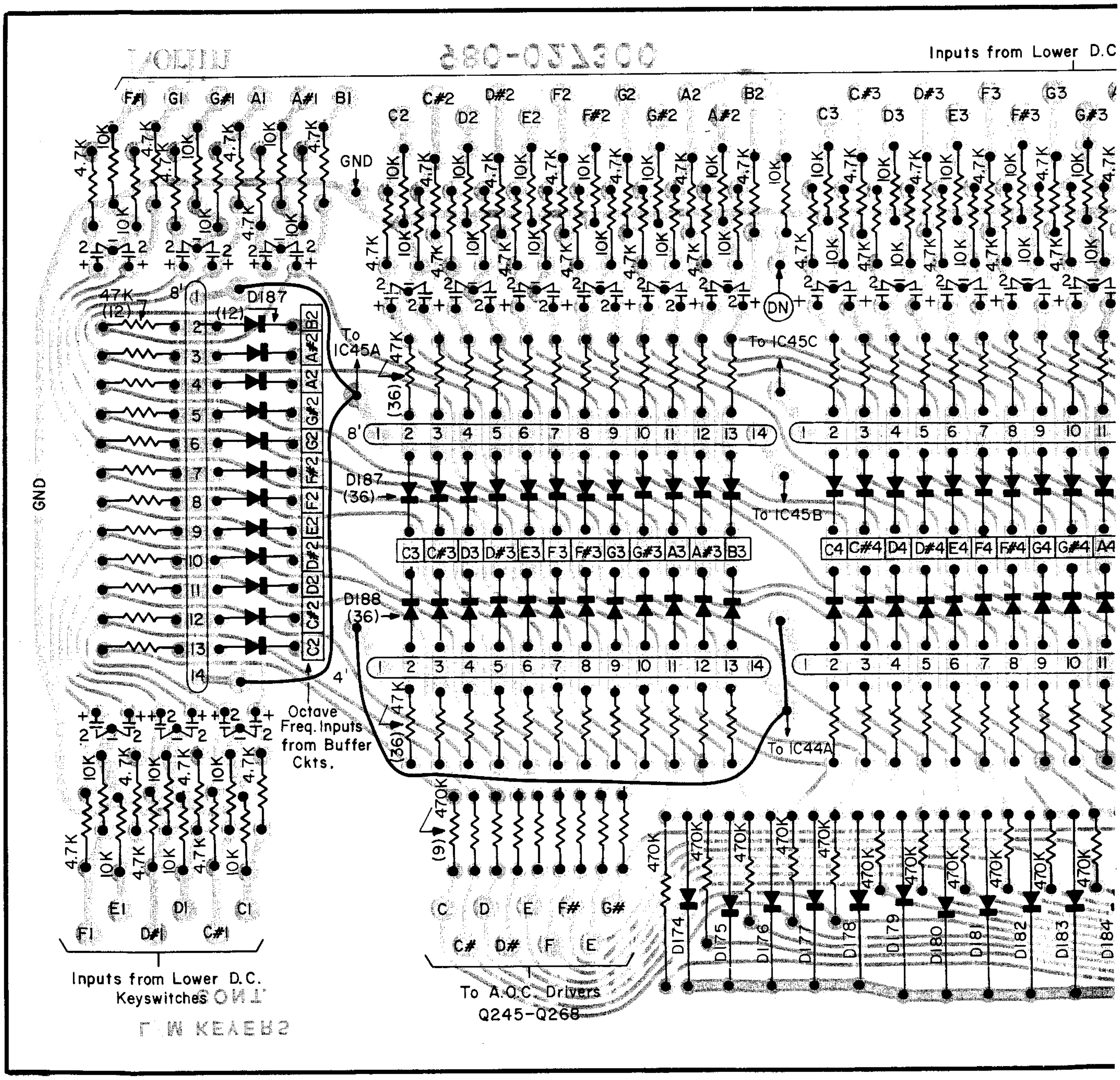

GND
C10
+500
From Pt.
VR19
Percussion Thump Adj.
+18V
+16V
-11V
+11V
IC61
IC62
IC66
IC67
IC73
Q150
Q151
Q188
Q190
Q191
Q192
Q193
Q194
Q196
Q199
Q200
To Pt.

Q. C. BOARD



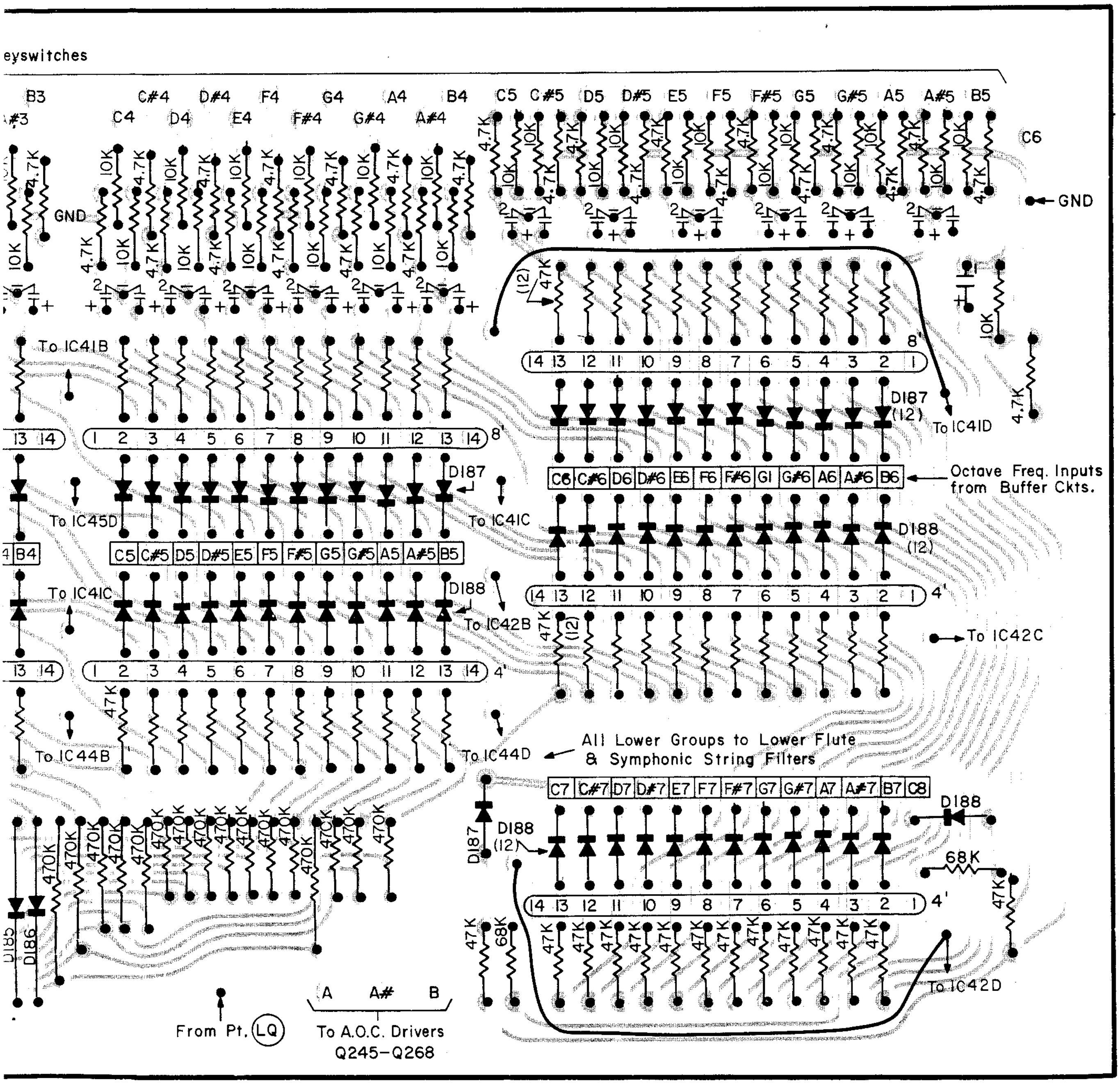
+11V
-11V
+12V
-12V
+18V
+16V
GND
TY
TW
TX
TV
TT
UB
From Pt.
D740
68P
J31
IC161
IC162
IC56
IC55
IC65
IC63
IC74
IC75
Q484
Q143
Q148
Q124
Q142
Q144
Q145
Q146
Q147
Q125
Q131
Q136
Q195
Q196
Q197
JD
TU
TS
DX
DW
DV
FA
J4
EG
50K
VR 15
Genie Thump Adj
J7
J2
FJ
FG
FF
FL
FK
FU
FM
FH
HN
FP
FQ
DR
DT
DU
DS
EK
HH
HG
HP
FT
EY
EL
-4V
To Pt.
820P
.0033
470K
120K
10K
6.8K

LOWER KEYING CONTROL &

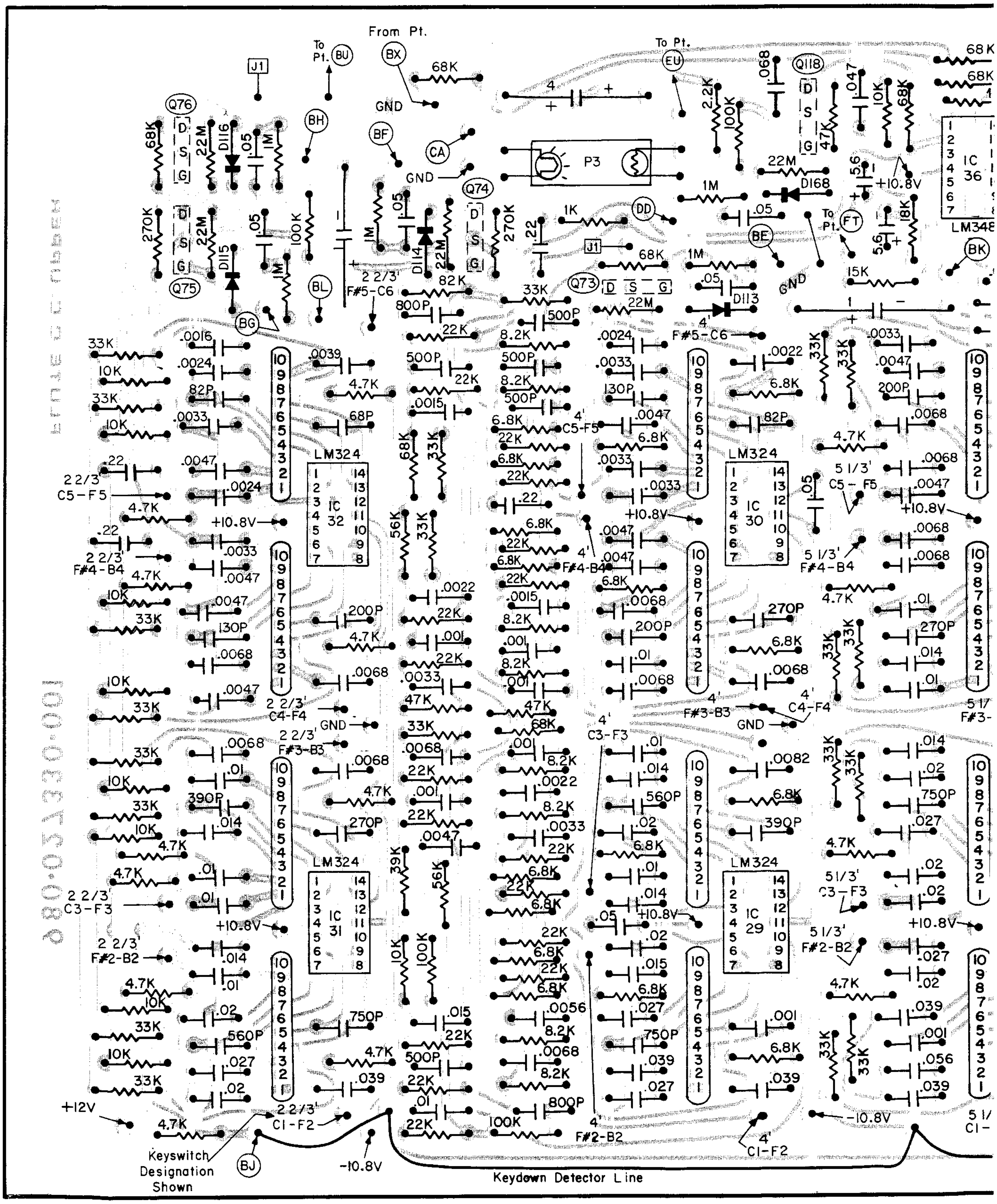


Inputs from Lower D.C
F#1 G1 G#1 A1 A#1 B1
C2 C#2 D2 D#2 E2 F2 F#2 G2 G#2 A2 A#2 B2
C3 C#3 D3 D#3 E3 F3 F#3 G3 G#3
4.7K
10K
GND
2
+
DN
47K
(12)
8'
D187
(12)
B2 A#2 A2 G#2 G2 F#2 F2 E2 D#2 D2 C#2 C2
1 2 3 4 5 6 7 8 9 10 11 12 13 14
To IC45A
(36)
To IC45C
D187 (36)
To IC45B
C3 C#3 D3 D#3 E3 F3 F#3 G3 G#3 A3 A#3 B3
C4 C#4 D4 D#4 E4 F4 F#4 G4 G#4 A4
D188 (36)
4'
Octave Freq. Inputs from Buffer Ckts.
To IC44A
470K
(9)
E1 D1 C1
F1 D#1 C#1
Inputs from Lower D.C. Keyswitches
C D E F# G#
C# D# F E
To A.O.C. Drivers Q245-Q268
D174 D175 D176 D177 D178 D179 D180 D181 D182 D183 D184
GND

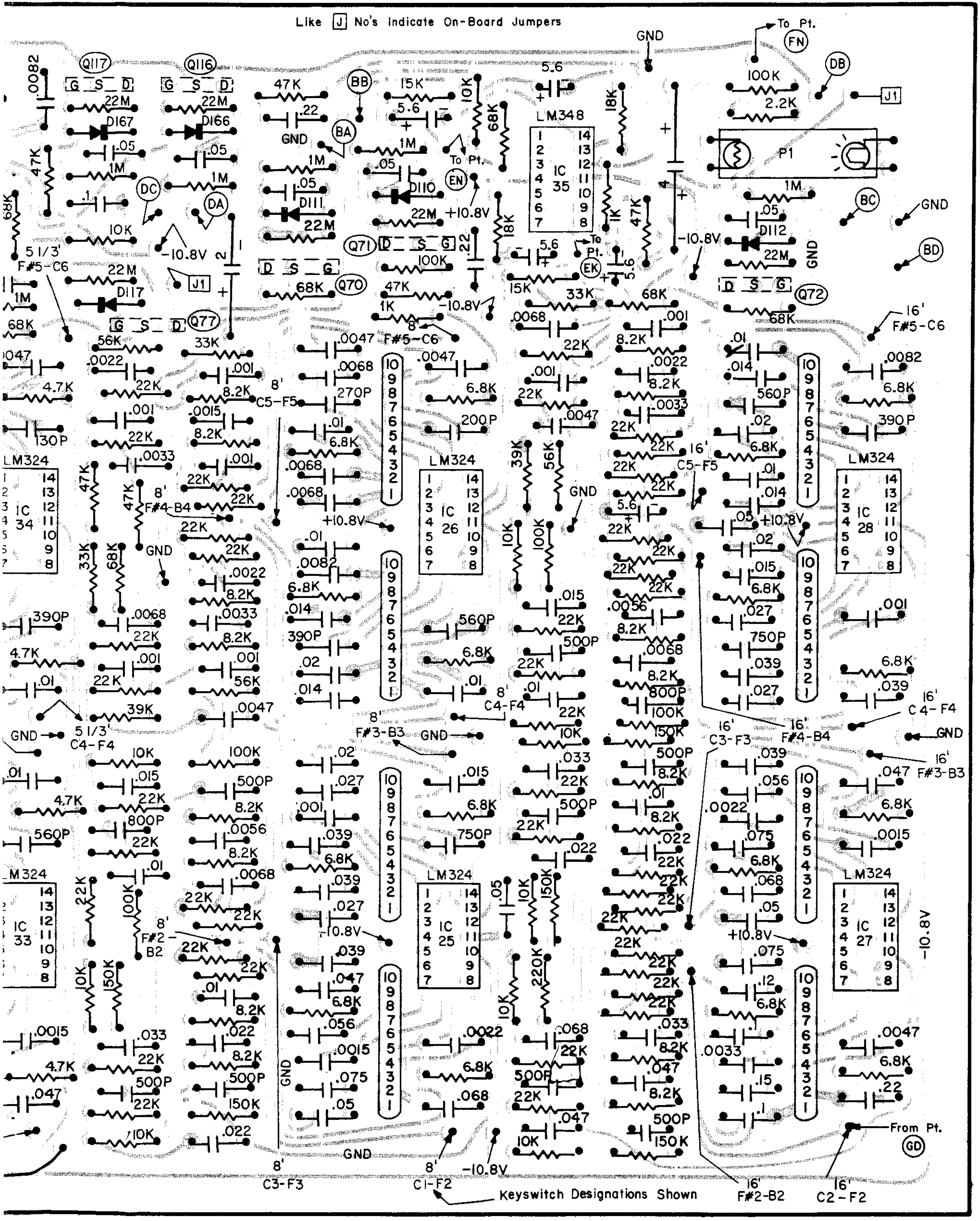
DIODE READOUT BOARD

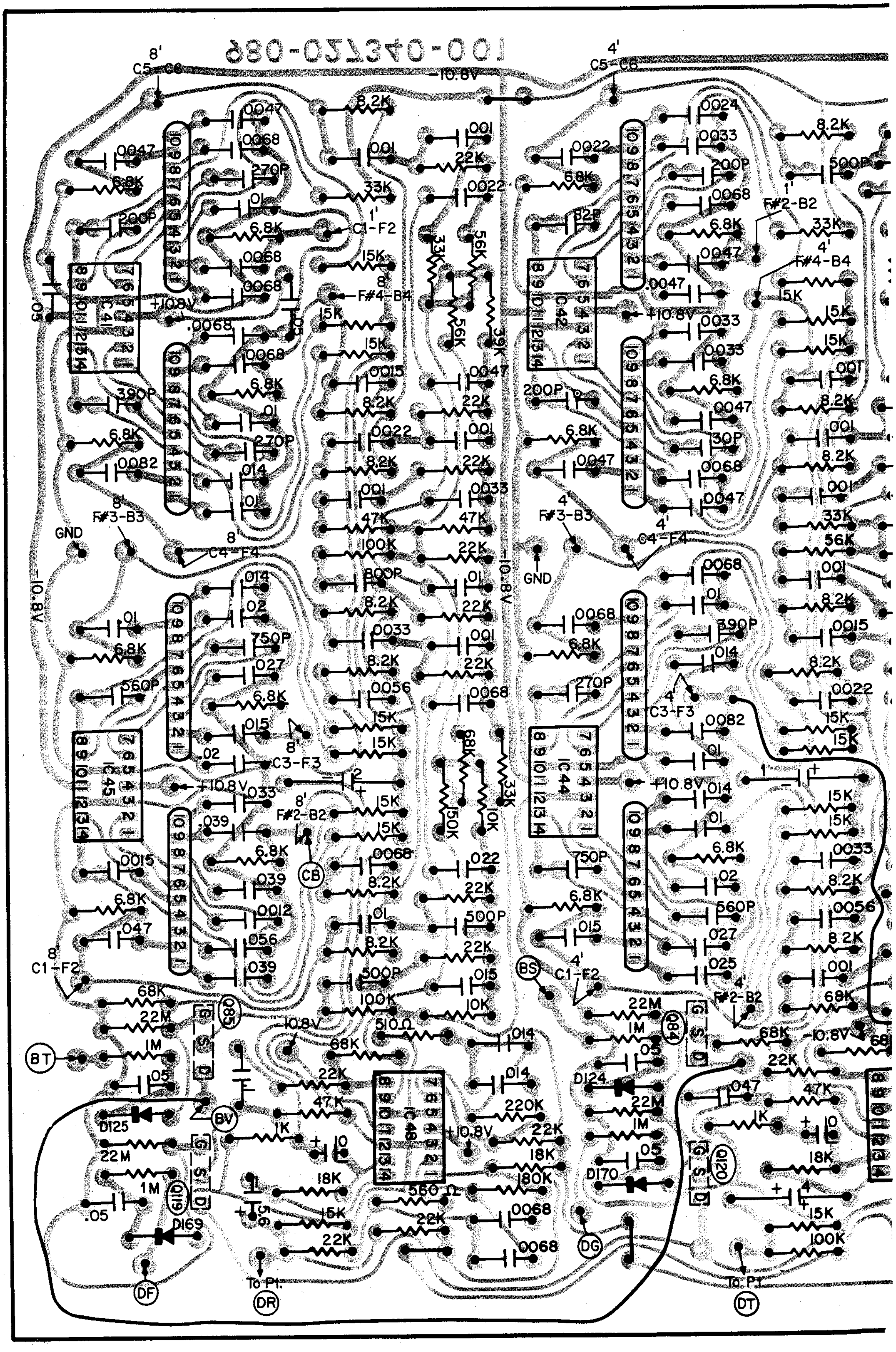

eyswitches
B3
#3
C4
C#4
D4
D#4
E4
F4
F#4
G4
G#4
A4
A#4
B4
C5
C#5
D5
D#5
E5
F5
F#5
G5
G#5
A5
A#5
B5
C6
GND
10K
4.7K
47K
68K
470K
To IC41B
To IC41D
To IC45D
To IC41C
To IC42B
To IC42C
To IC44B
To IC44D
To IC42D
D185
D186
D187
D188
(12)
8'
4'
C5 C#5 D5 D#5 E5 F5 F#5 G5 G#5 A5 A#5 B5
C6 C#6 D6 D#6 E6 F6 F#6 G1 G#6 A6 A#6 B6
C7 C#7 D7 D#7 E7 F7 F#7 G7 G#7 A7 A#7 B7 C8
1 2 3 4 5 6 7 8 9 10 11 12 13 14
14 13 12 11 10 9 8 7 6 5 4 3 2 1
Octave Freq. Inputs from Buffer Ckts.
All Lower Groups to Lower Flute & Symphonic String Filters
From Pt. LQ
A A# B
To A.O.C. Drivers Q245–Q268

UPPER FLUTE & SYMP.

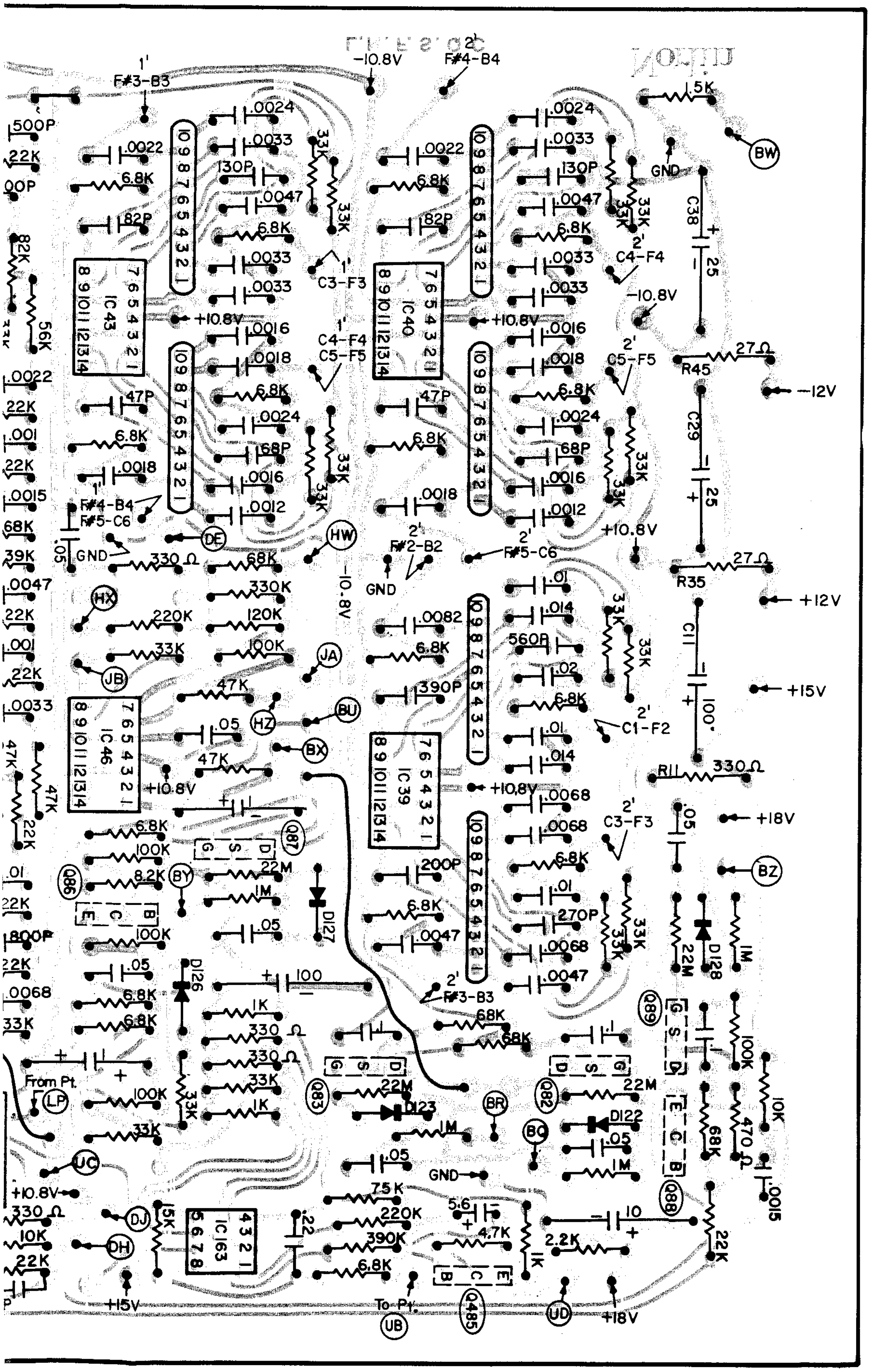

From Pt.
To Pt.
BU
BX
68K
GND
J1
Q76
D
S
G
68K
22M
D116
.05
1M
BH
BF
CA
4
+
To Pt.
EU
P3
.068
Q118
2.2K
100K
.047
47K
10K
68K
22M
D168
5.6
+10.8V
18K
IC 36
LM348
GND
Q74
270K
.22
1K
DD
.05
BE
To Pt.
FT
5.6
1M
Q75
D115
270K
22M
.05
100K
1M
1M
D114
22M
J1
68K
1M
BK
15K
BL
2 2/3'
F#5-C6
82K
33K
Q73
.05
D113
GND
BG
800P
500P
22M
4'
F#5-C6
.0024
.0033
.0047
.0022
33K
33K
10K
.0016
.0024
82P
.0033
.0039
4.7K
.0015
68P
22K
500P
8.2K
130P
4'
C5-F5
6.8K
82P
LM324
IC 32
IC 30
IC 31
IC 29
.22
2 2/3'
C5-F5
+10.8V
5 1/3'
C5-F5
56K
33K
68K
.0068
.0047
4'
F#4-B4
5 1/3'
F#4-B4
2 2/3'
F#4-B4
.0022
200P
270P
.001
.01
.014
2 2/3'
C4-F4
4'
C4-F4
4'
F#3-B3
5 1/3'
F#3-
GND
2 2/3'
F#3-B3
4'
C3-F3
47K
.0082
390P
560P
750P
.027
39K
56K
2 2/3'
C3-F3
5 1/3'
C3-F3
2 2/3'
F#2-B2
5 1/3'
F#2-B2
4'
F#2-B2
10K
100K
.015
.0056
.039
.056
.02
+12V
4.7K
2 2/3'
C1-F2
4'
C1-F2
5 1/
C1-
-10.8V
BJ
Keyswitch Designation Shown
Keydown Detector Line
100K

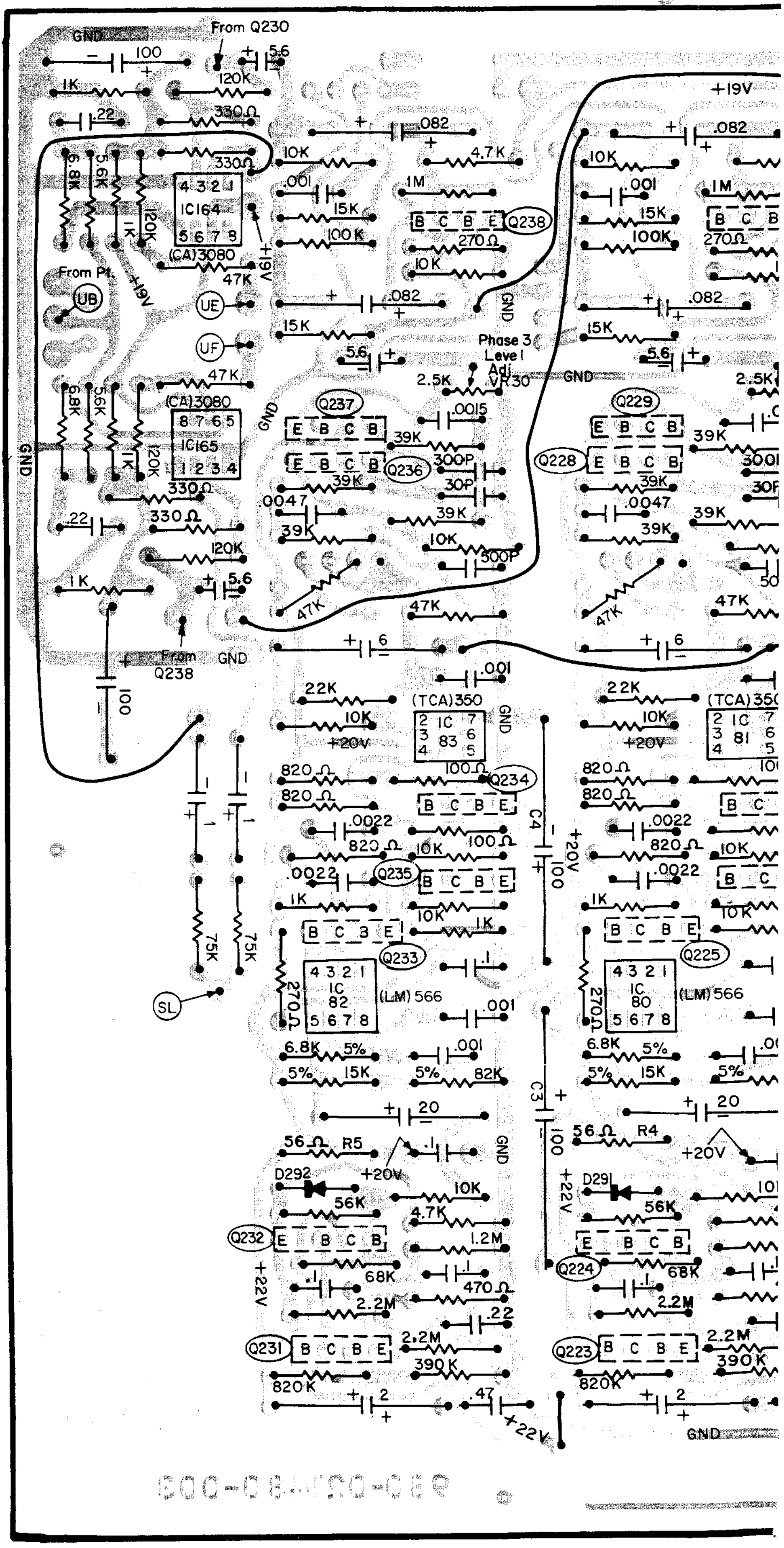
STRING FILTER BOARD


Like J No's Indicate On-Board Jumpers
GND
To Pt. FN
DB
J1
Q117
Q116
BB
BA
LM348
IC 35
P1
BC
BD
DC
DA
EN
EK
Q71
Q70
Q77
Q72
LM324
IC 34
IC 26
IC 28
IC 33
IC 25
IC 27
+10.8V
-10.8V
5 1/3' F#5-C6
5 1/3' C4-F4
8' C5-F5
8' F#4-B4
8' F#3-B3
8' C4-F4
8' F#2-B2
8' C3-F3
8' C1-F2
16' F#5-C6
16' C5-F5
16' C4-F4
16' F#4-B4
16' C3-F3
16' F#3-B3
16' F#2-B2
16' C2-F2
From Pt. GD
Keyswitch Designations Shown

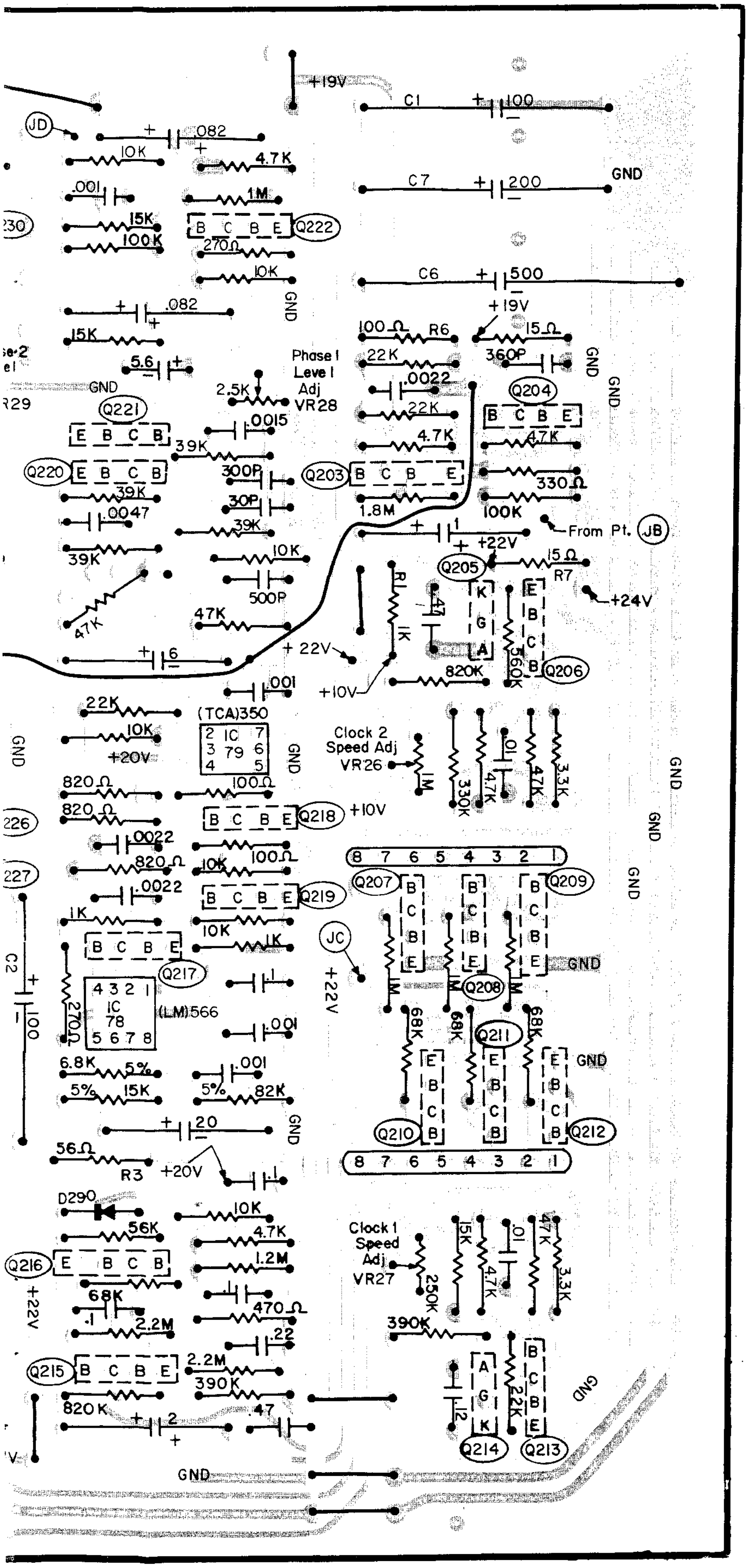

100-047720-086
8' C5-C6
4' C5-C6
-10.8V
+10.8V
1' C1-F2
8' F#4-B4
8' F#3-B3
8' C4-F4
4' F#3-B3
4' C4-F4
1' F#2-B2
4' F#4-B4
8' C3-F3
4' C3-F3
8' F#2-B2
8' C1-F2
4' C1-F2
4' F#2-B2
GND
IC 41
IC 42
IC 45
IC 44
IC 48
Q85
Q84
Q119
Q120
D124
D125
D169
D170
BT
BV
BS
CB
DF
DR
DG
DT
To P1
8.2K
6.8K
15K
22K
33K
47K
56K
68K
100K
10K
18K
22M
1M
1K
220K
180K
510Ω
560Ω
.0047
.0068
.0022
.0033
.001
.01
.05
200P
270P
390P
500P
750P
560P
800P

TRING FILTER BOARD


1'
F#3-B3
-10.8V
2'
F#4-B4
500P
22K
.0022
6.8K
82P
.0024
.0033
130P
.0047
6.8K
.0033
.0033
33K
33K
C3-F3
IC43
+10.8V
.0016
.0018
C4-F4
C5-F5
6.8K
47P
.0024
68P
.0016
.0012
33K
33K
.0018
F#4-B4
F#5-C6
.05
GND
330 Ω
68K
DE
HW
IC40
2'
F#2-B2
F#5-C6
GND
-10.8V
.0082
5K
BW
GND
C38
25
C4-F4
-10.8V
C5-F5
27Ω
R45
-12V
C29
25
+10.8V
27Ω
R35
+12V
C11
100
+15V
C1-F2
330Ω
R11
+18V
C3-F3
BZ
HX
220K
120K
330K
100K
33K
JA
JB
47K
HZ
BU
.05
BX
47K
IC46
+10.8V
Q87
G S D
22M
1M
Q86
8.2K
BY
E C B
100K
.05
D127
D126
100
1K
330 Ω
330 Ω
33K
1K
100K
From Pt.
LP
33K
UC
+10.8V
330 Ω
10K
22K
DJ
DH
5K
IC163
.22
+15V
IC39
.01
.014
560P
.02
6.8K
390P
.01
.014
.0068
.0068
200P
6.8K
.0047
.01
270P
.0068
.0047
F#3-B3
68K
68K
Q83
22M
D123
1M
BR
BQ
Q82
22M
D122
.05
1M
.05
GND
75K
220K
390K
6.8K
5.6
4.7K
1K
B C E
Q485
To Pt.
UB
UD
+18V
10
2.2K
22K
Q88
E C B
Q89
G S D
D128
22M
1M
100K
68K
470Ω
10K
.0015

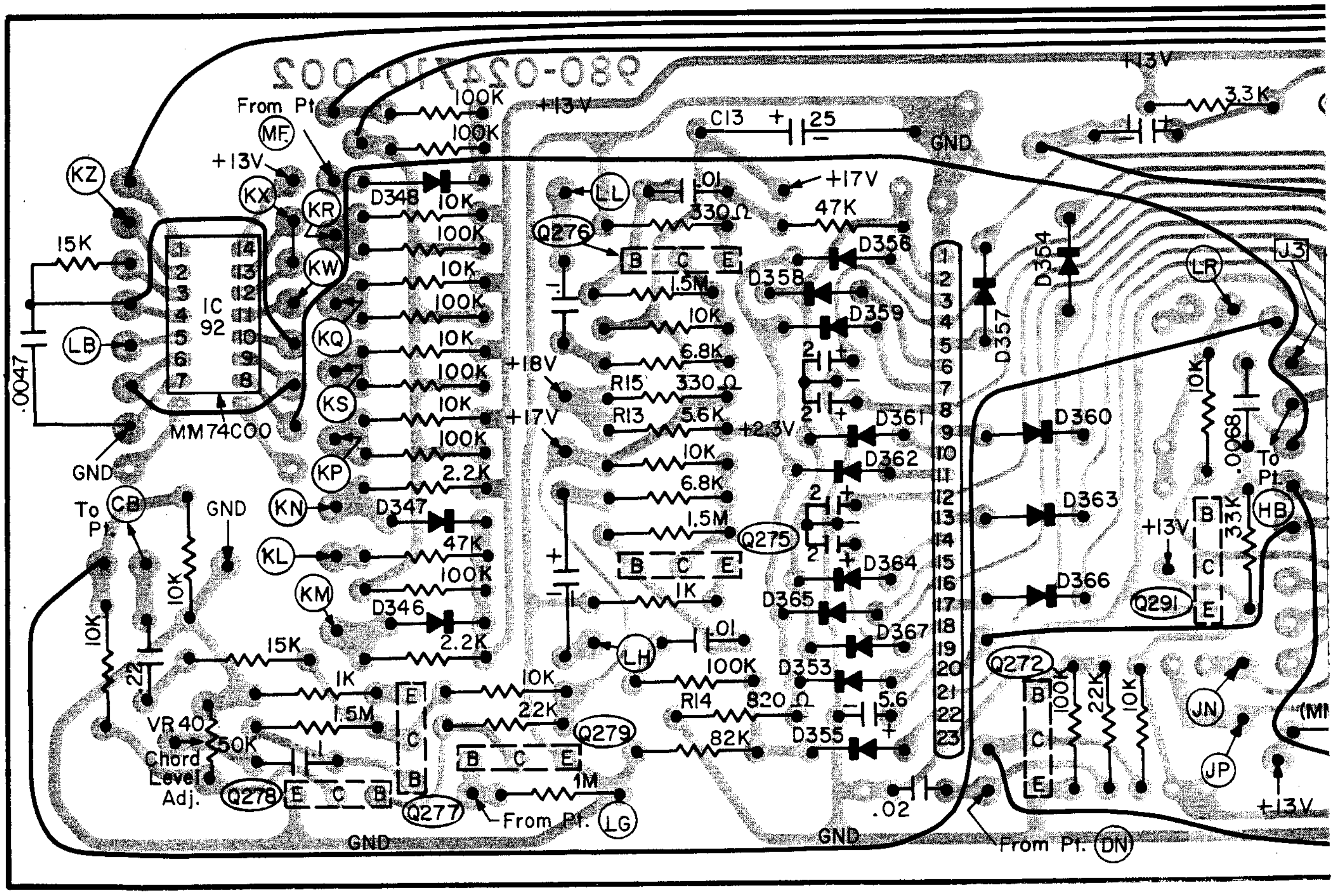

GND
From Q230
100
5.6
1K
120K
.22
330Ω
6.8K
5.6K
1K
120K
4 3 2 1
IC164
5 6 7 8
(CA)3080
47K
+19V
From Pt.
UB
UE
UF
(CA)3080
8 7 6 5
IC165
1 2 3 4
56K
330Ω
From Q238
100
.082
10K
4.7K
.001
1M
15K
100K
Q238
B C B E
270Ω
Phase 3 Level Adj. VR30
2.5K
Q237
Q236
E B C B
39K
.0015
300P
30P
.0047
47K
6
22K
(TCA)350
IC 83
+20V
820Ω
100Ω
Q234
Q235
.0022
Q233
IC 82
(LM) 566
270Ω
.001
6.8K 5%
5% 15K
5% 82K
20
C4
C3
+20V
+22V
56Ω R5
D292
Q232
1.2M
68K
470Ω
2.2M
.22
Q231
390K
820K
2
.47
+22V
75K
SL
Q229
Q228
Q225
IC 80
IC 81
(TCA)350
56Ω R4
D291
Q224
Q223
+19V
GND
980-02183-003

ILATOR



+19V
C1
100
C7
200
GND
C6
500
JD
.082
10K
4.7K
.001
1M
15K
100K
Q222
B C B E
270Ω
10K
GND
.082
15K
5.6
GND
R29
Q221
E B C B
Q220
E B C B
2.5K
Phase I Level Adj VR28
.0015
39K
39K
300P
30P
.0047
39K
39K
10K
500P
47K
47K
6
+19V
100Ω R6
15Ω
22K
360P
GND
.0022
22K
Q204
B C B E
4.7K
47K
Q203
B C B E
330Ω
1.8M
100K
From Pt. JB
+22V
Q205
15Ω
R7
+24V
K G A
E B C B
Q206
1K
.47
560K
820K
+22V
+10V
.001
22K
(TCA)350
IC 79
2 3 4 7 6 5
10K
+20V
GND
Clock 2 Speed Adj VR26
1M
330K
4.7K
.01
47K
3.3K
820Ω
100Ω
Q218
B C B E
+10V
820Ω
Q226
.0022
820Ω
10K
100Ω
Q227
.0022
Q219
B C B E
8 7 6 5 4 3 2 1
Q207
B C B E
Q209
1K
10K
1K
JC
+22V
C2
100
Q217
B C B E
4 3 2 1
IC 78
5 6 7 8
(LM)566
270Ω
1M
1M
Q208
1M
GND
68K
68K
68K
Q211
E B C B
GND
.001
6.8K 5%
.001
5%
15K
5%
82K
20
GND
Q210
Q212
56Ω
R3
+20V
8 7 6 5 4 3 2 1
GND
D290
10K
56K
4.7K
Q216
E B C B
1.2M
Clock 1 Speed Adj VR27
250K
15K
4.7K
.01
47K
3.3K
68K
470Ω
.1
2.2M
390K
.22
Q215
B C B E
2.2M
390K
A G K
B C B E
22K
.12
GND
Q214
Q213
820K
2
.47
+22V
GND

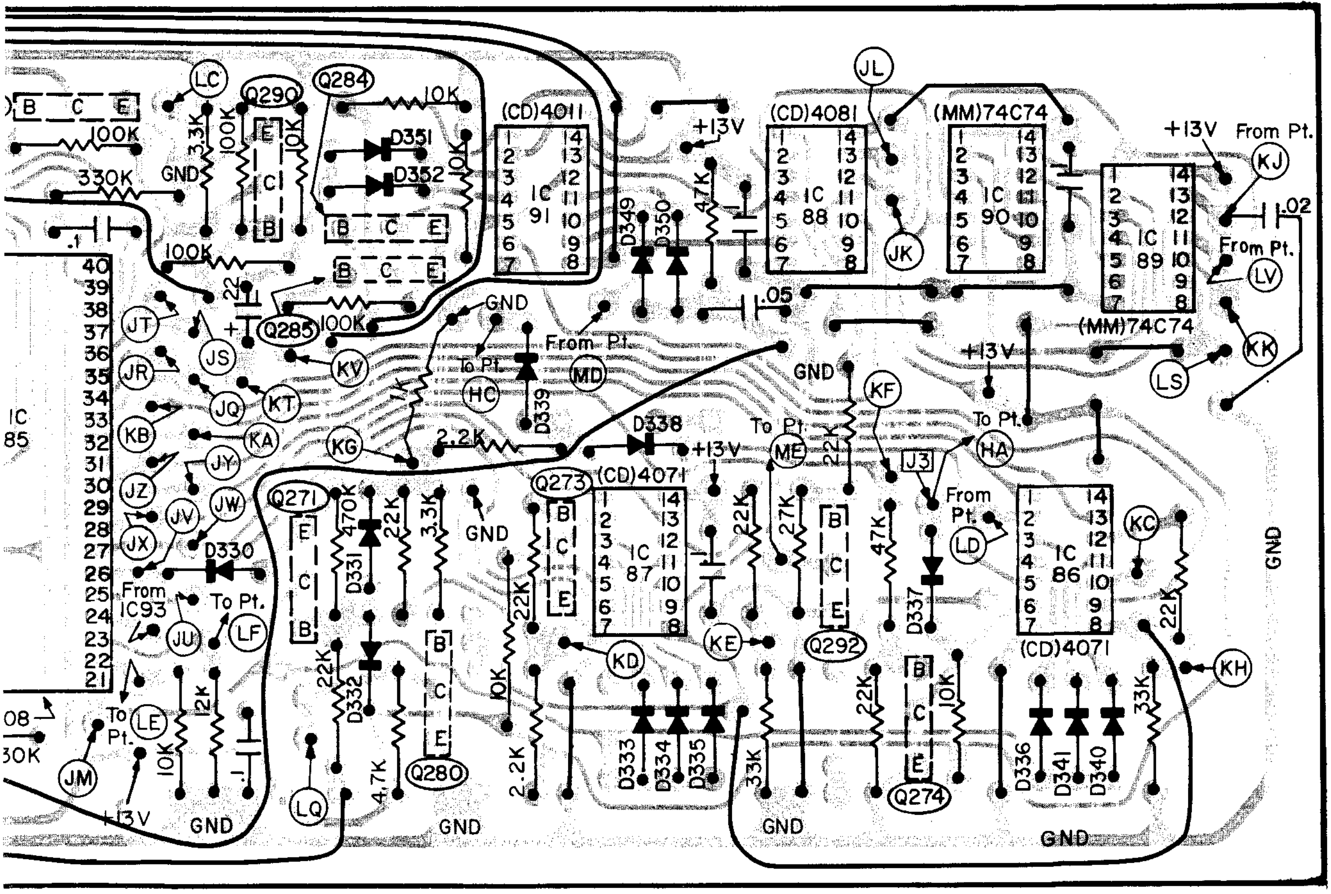
CHORD FUNCTION



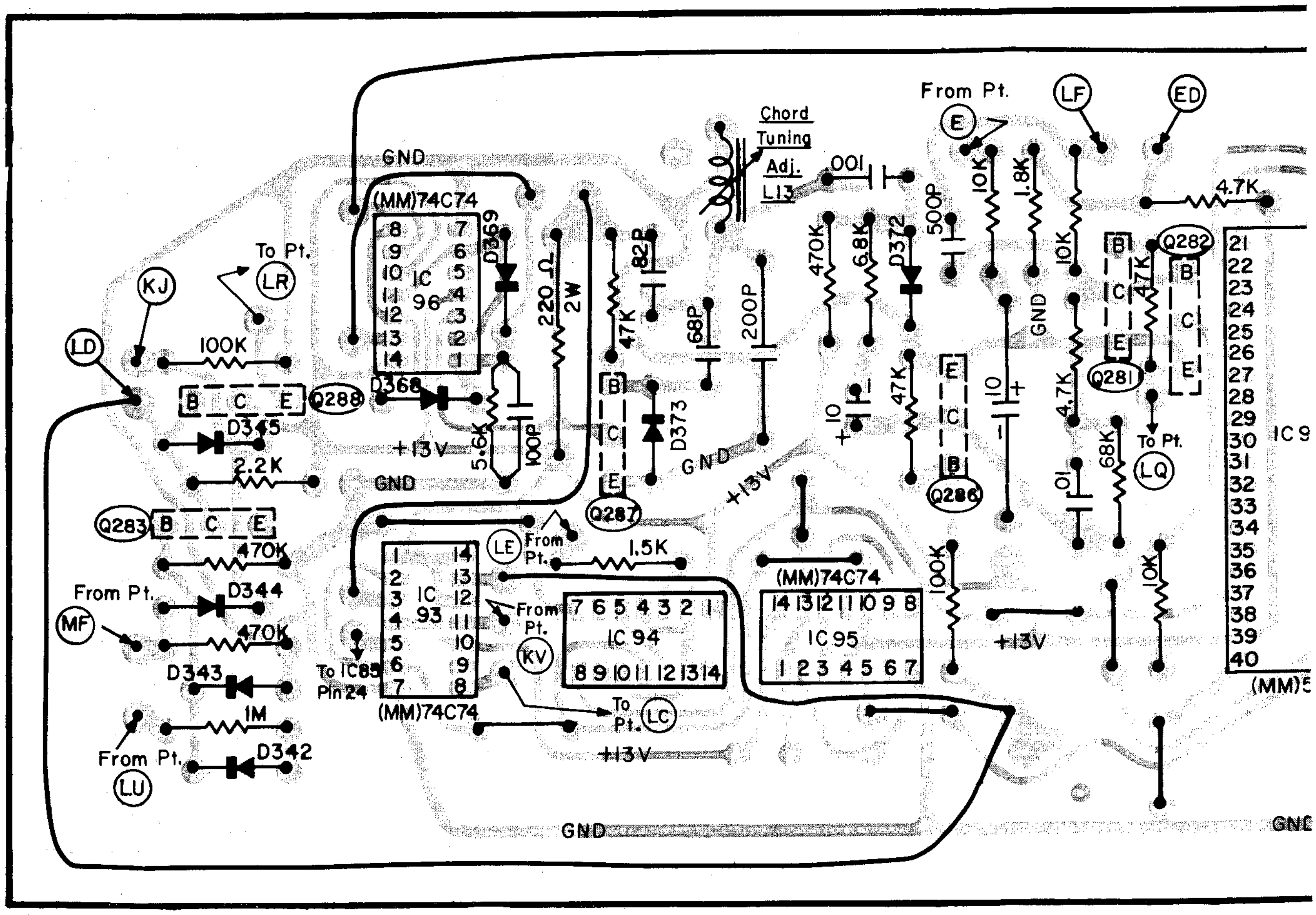
980-024710-002
From Pt.
MF
+13V
KZ
KX
KR
KW
KQ
KS
KP
KN
KL
KM
LB
CB
To Pt.
GND
15K
.0047
IC 92
MM74C00
D348
D347
D346
100K
10K
47K
2.2K
1K
1.5M
22K
82K
1M
VR40 50K
Chord Level Adj.
.22
Q278
Q277
Q279
Q276
Q275
E C B
LL
LH
LG
C13 .25
.01
330 Ω
+17V
+18V
6.8K
R15 330 Ω
R13 5.6K
+2.3V
R14 820 Ω
5.6
.02
D356
D358
D359
D361
D362
D364
D365
D367
D353
D355
D357
D354
D360
D363
D366
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
3.3K
LR
J3
10K
.0068
33K
HB
Q291
Q272
JN
JP
DN

GENERATOR BOARD

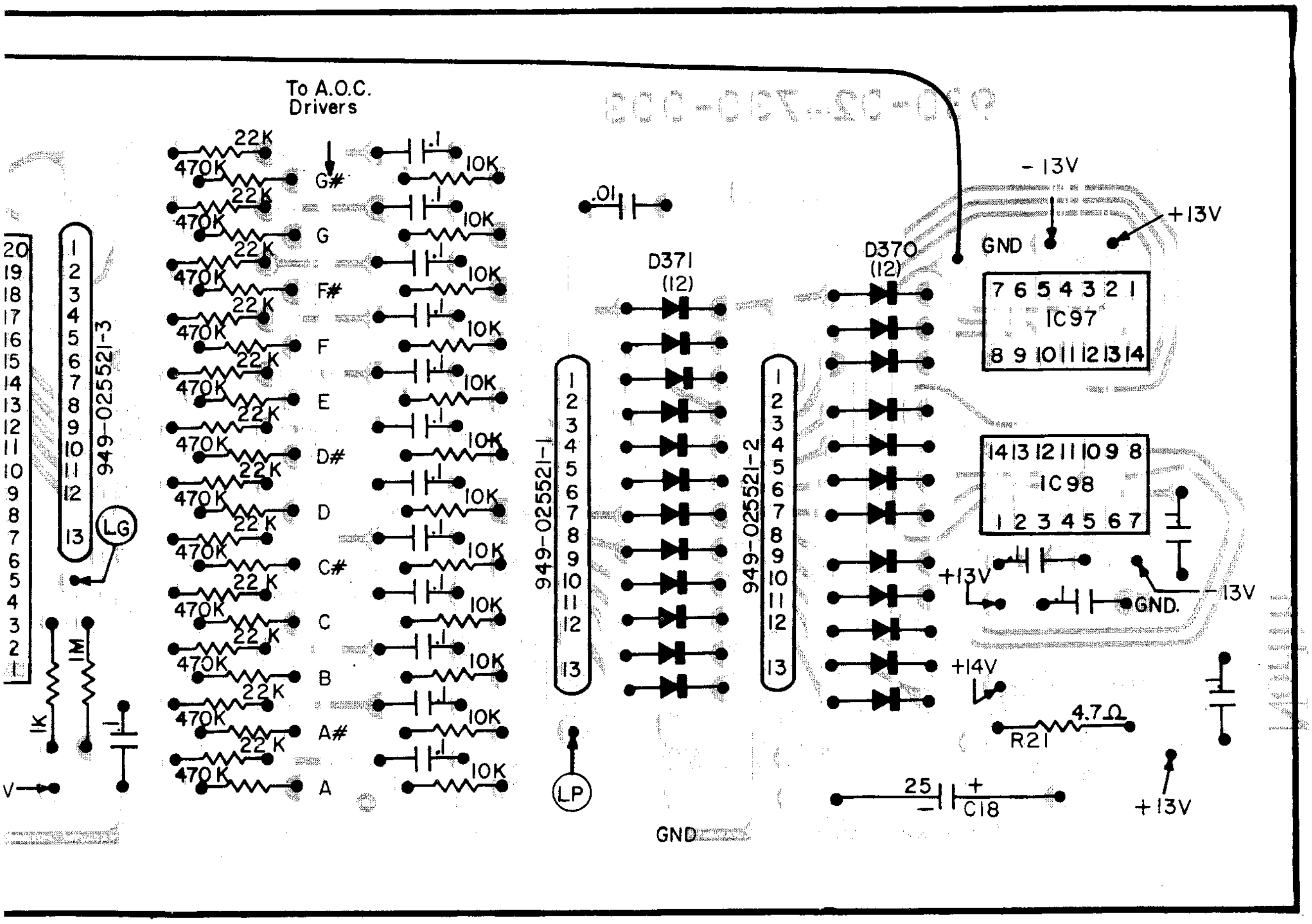
Like [J] No's Indicate On Board Jumpers


(CD)4011
IC 91
(CD)4081
IC 88
(MM)74C74
IC 90
IC 89
(MM)74C74
(CD)4071
IC 87
(CD)4071
IC 86
IC 85
Q290
Q284
Q285
Q271
Q273
Q280
Q292
Q274
D351
D352
D349
D350
D339
D338
D330
D331
D332
D333
D334
D335
D336
D341
D340
D337
J3
+13V
GND
From Pt.
To Pt.
From IC93
LC
JL
JK
KJ
LV
KK
LS
KF
HA
ME
MD
HC
KV
KG
JT
JS
JR
JQ
KT
KB
KA
JY
JZ
JW
JV
JX
JU
LF
LE
JM
LQ
KD
KE
LD
KC
KH
100K
330K
3.3K
10K
22
.1
.05
.02
4.7K
2.2K
22K
470K
27K
47K
33K
12K
1K

MAGIC GENIE, 4' T.O.S

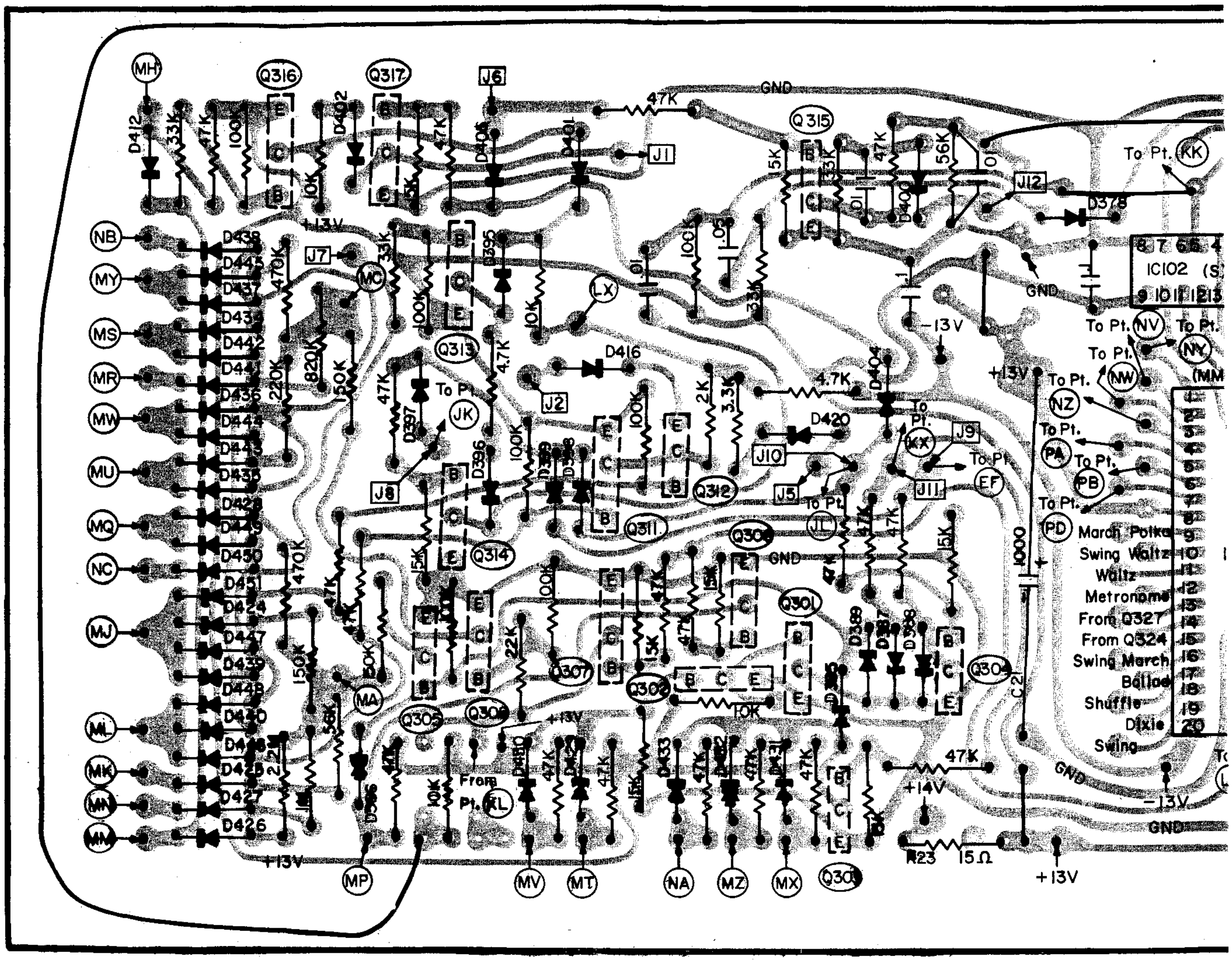

GND
(MM)74C74
IC 96
D369
D368
220 Ω 2W
47K
82P
68P
200P
Chord Tuning Adj. L13
.001
From Pt. E
LF
ED
10K
1.8K
500P
470K
6.8K
D372
10K
GND
4.7K
Q282
B C E
Q281
47K
To Pt. LQ
68K
.01
10
Q286
Q287
D373
GND
+13V
5.6K
100P
To Pt. LR
KJ
LD
100K
Q288
D345
2.2K
GND
Q283
470K
From Pt. MF
D344
470K
D343
1M
From Pt. LU
D342
LE From Pt.
1.5K
IC 93
(MM)74C74
From Pt. KV
To IC85 Pin24
To Pt. LC
IC 94
(MM)74C74
IC 95
100K
10K
+13V
21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40
IC 9
(MM)5
GND

& OSC. BOARD



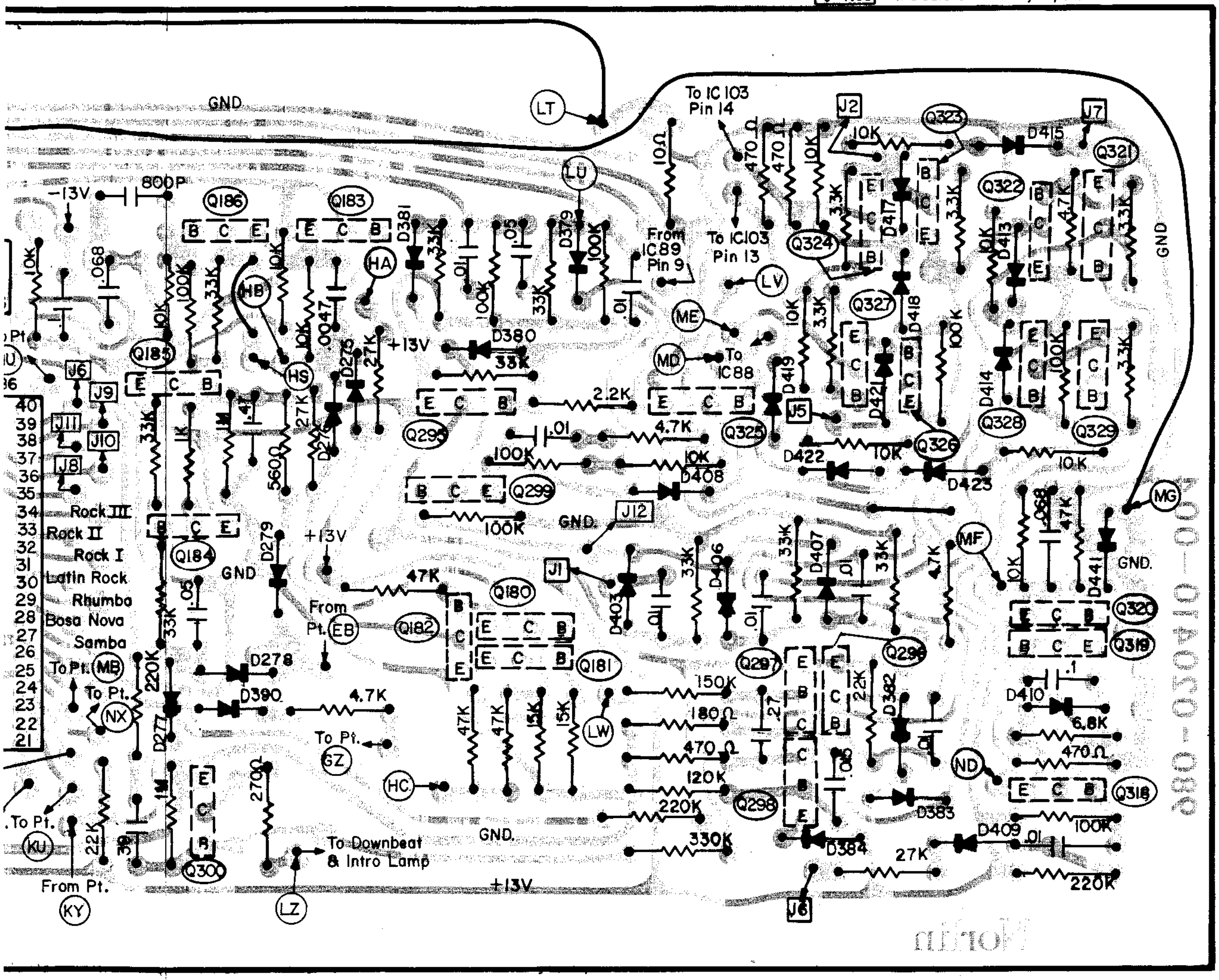
To A.O.C. Drivers
22K
470K
10K
.1
G#
G
F#
F
E
D#
D
C#
C
B
A#
A
20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
949-02552I-3
949-02552I-1
949-02552I-2
1 2 3 4 5 6 7 8 9 10 11 12 13
LG
LP
1K
1M
.01
D371 (12)
D370 (12)
-13V
+13V
GND
IC97
7 6 5 4 3 2 1
8 9 10 11 12 13 14
IC98
14 13 12 11 10 9 8
1 2 3 4 5 6 7
+13V
GND.
-13V
+14V
4.7Ω
R21
25
C18
+13V
GND

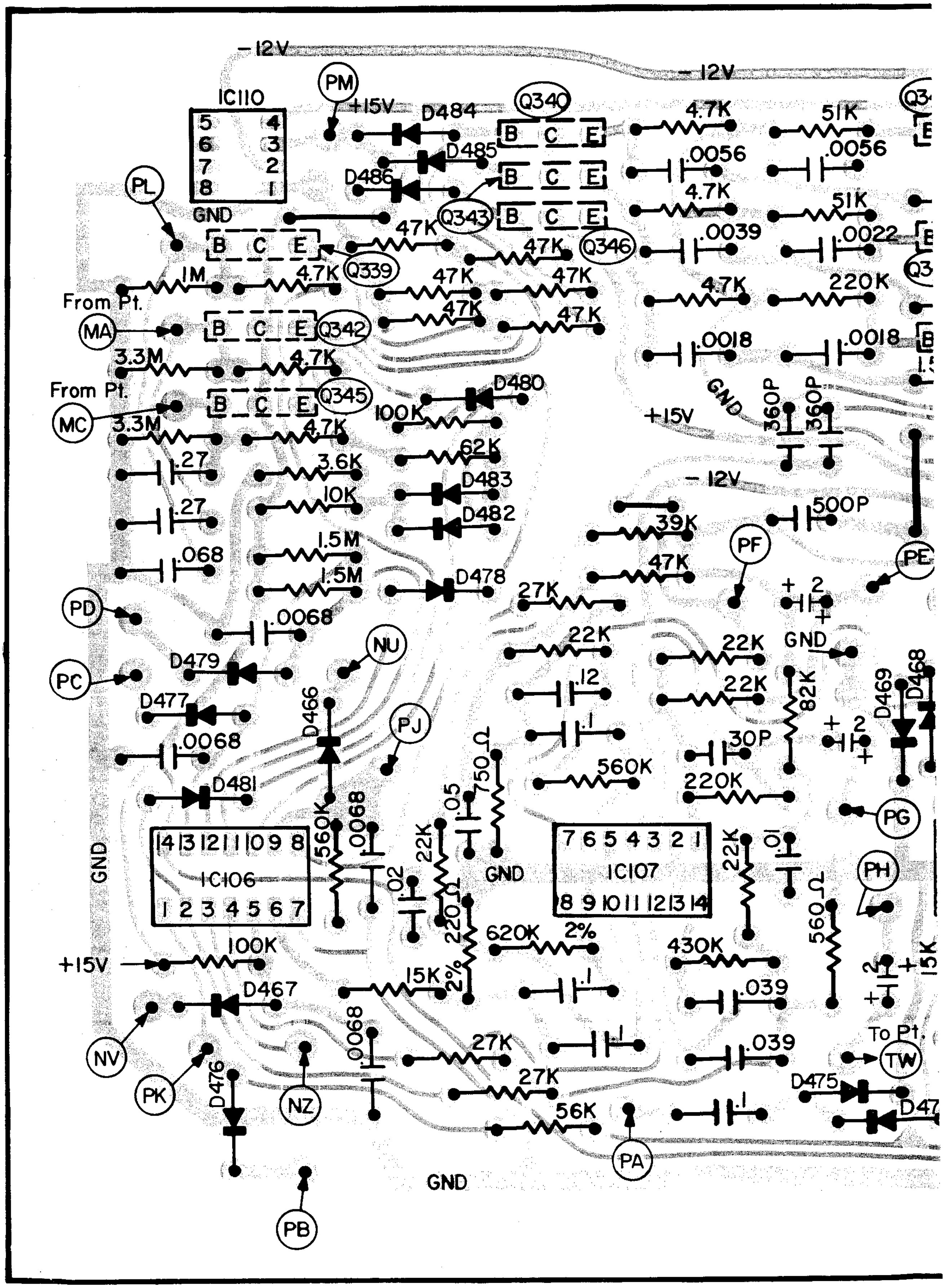
RHYTHM CLOCK


MH
Q316
Q317
J6
47K
GND
Q315
To Pt. KK
D412
33K
47K
100K
E
C
B
10K
D402
5K
4.7K
D401
D400
J1
5K
3.3K
47K
.01
56K
.01
J12
D378
+13V
NB
MY
MS
MR
MW
MU
MQ
NC
MJ
ML
MK
MN
MM
D438
D445
D437
D439
D442
D441
D436
D444
D443
D435
D429
D449
D450
D451
D424
D447
D439
D448
D430
D428
D425
D427
D426
J7
MC
33K
470K
220K
820K
150K
D395
100K
10K
LX
.01
100K
.05
33K
IC102
8 7 6 5 4
9 10 11 12 13
GND
.1
-13V
To Pt. NV
To Pt. NY
To Pt. NW
To Pt. NZ
Q313
4.7K
D416
47K
D397
To Pt. JK
J2
2K
3.3K
4.7K
D404
+13V
D420
To Pt. KX
J9
To Pt. EF
To Pt. PA
To Pt. PB
To Pt. PD
J8
D396
100K
J10
J5
To Pt. JL
J11
Q312
Q311
Q314
Q308
GND
47K
15K
1000
March Polka 9
Swing Waltz 10
Waltz 11
Metronome 12
From Q327 14
From Q324 15
Swing March 16
Ballad 17
Shuffle 18
Dixie 19
Swing 20
1
2
3
4
5
6
7
8
470K
150K
10K
22K
Q307
Q302
Q301
Q305
Q306
Q304
Q303
C21
MA
56K
2.2K
10K
D389
D398
+13V
10K
47K
D433
D432
D431
From Pt. RL
From
D410
47K
47K
15K
47K
4.7K
+14V
R23
15Ω
+13V
-13V
GND
MP
MV
MT
NA
MZ
MX
Q309

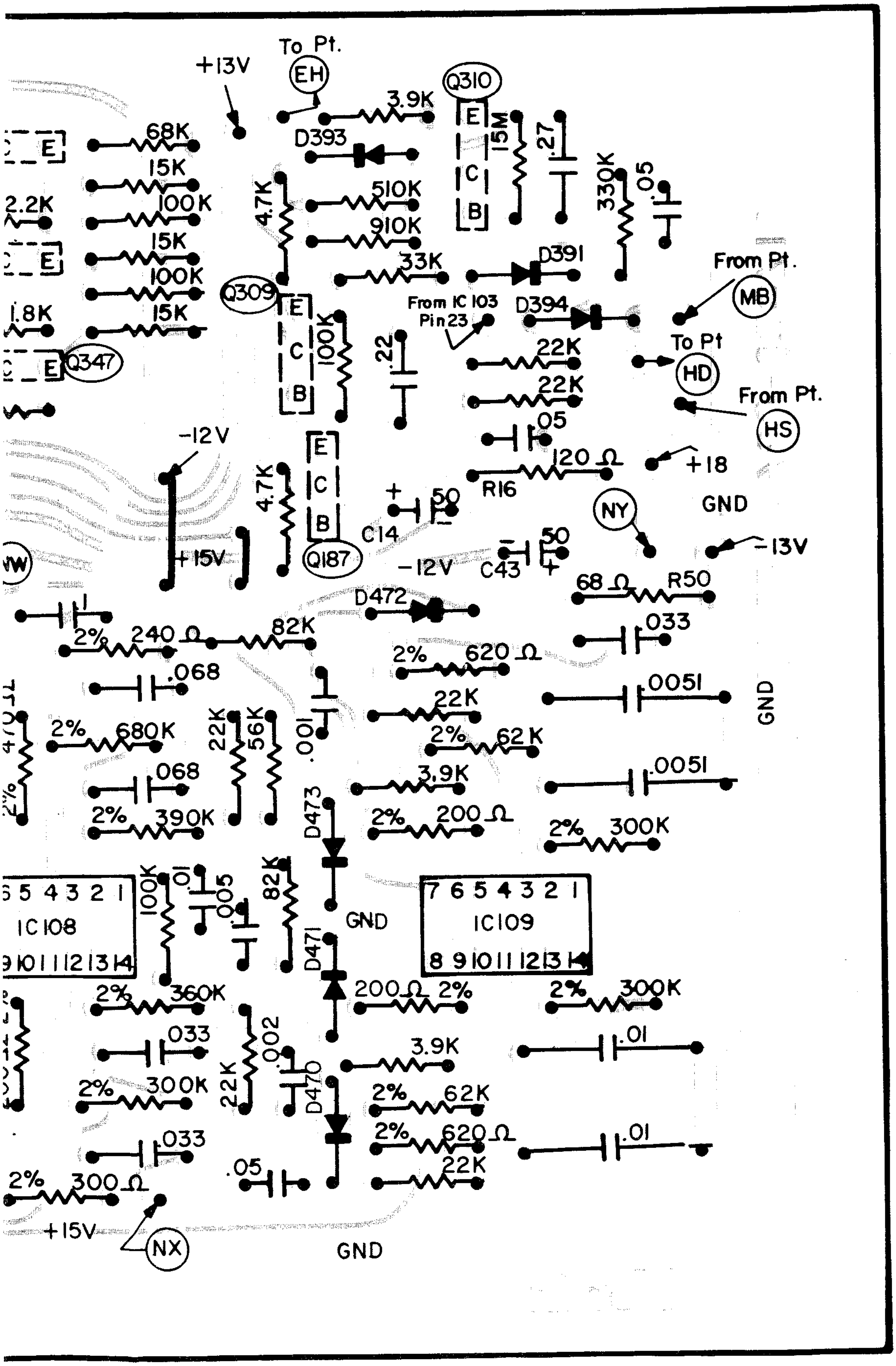
BOARD

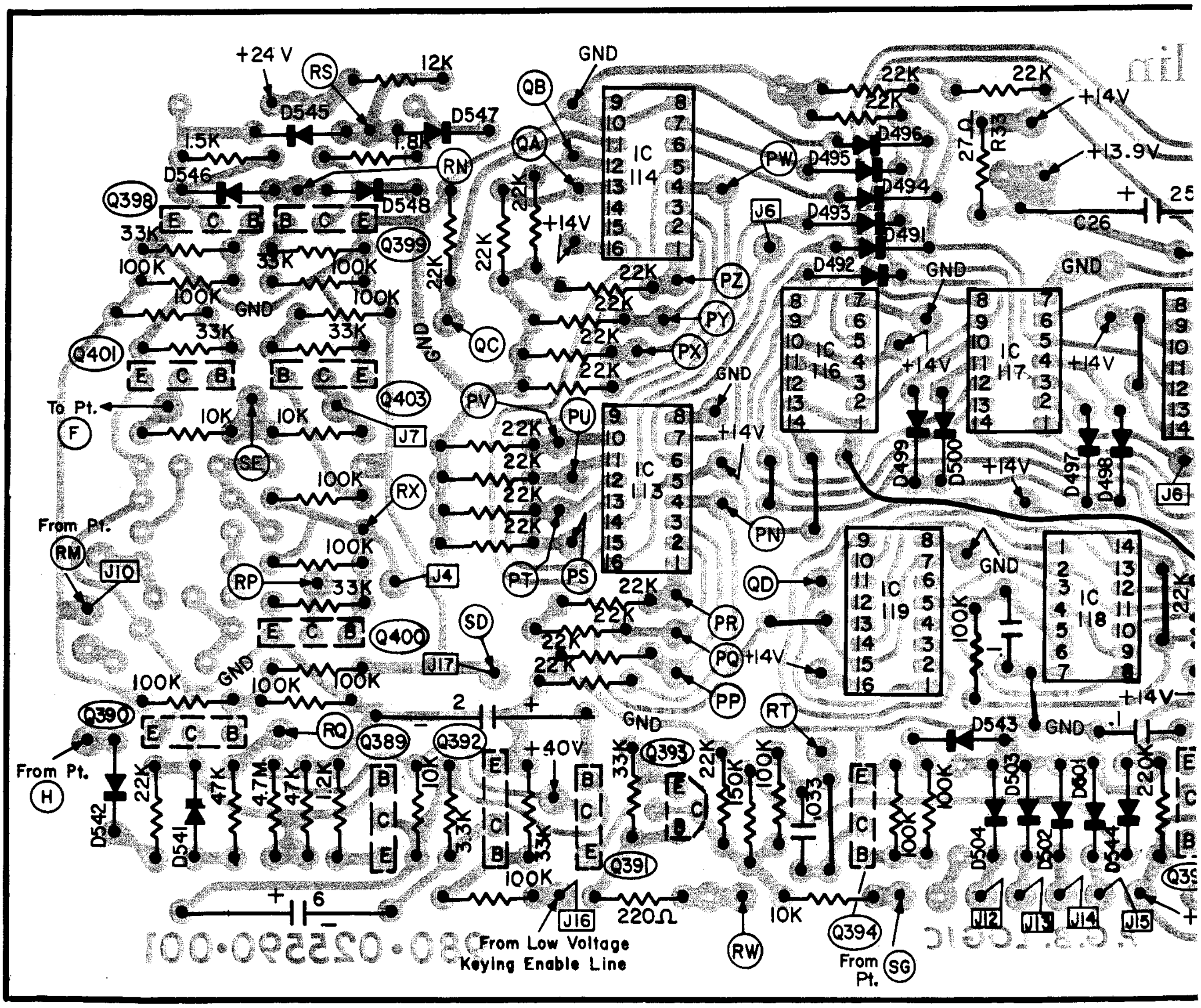
"J" Nos Indicate on board jumpers


GND
LT
LU
To IC 103 Pin 14
From IC89 Pin 9
To IC103 Pin 13
LV
ME
MD
To IC88
J2
J7
J5
J6
J9
J11
J10
J8
J12
J1
-13V
800P
Q186
Q183
Q185
Q184
Q295
Q299
Q180
Q182
Q181
Q300
Q323
Q321
Q322
Q324
Q327
Q325
Q326
Q328
Q329
Q320
Q319
Q318
Q297
Q296
Q298
HA
HB
HS
HC
D381
D379
D380
D278
D279
D277
D390
D415
D417
D413
D418
D419
D421
D414
D422
D423
D408
D403
D406
D407
D382
D383
D384
D409
D410
D441
+13V
GND.
From Pt. EB
To Pt. MB
To Pt. NX
To Pt. GZ
To Pt. KU
From Pt. KY
To Downbeat & Intro Lamp
LZ
LW
MF
MG
ND
40
39
38
37
36
35
34 Rock III
33 Rock II
32 Rock I
31
30 Latin Rock
29 Rhumba
28 Bosa Nova
27 Samba
26
25
24
23
22
21
10K
.068
100K
33K
1K
1M
.47
560Ω
27K
.0047
2.2K
4.7K
.01
.05
15K
47K
150K
180Ω
470Ω
120K
220K
330K
2700
22K
39
6.8K
100K
10Ω
470Ω
3.3K
.1
.27


-12V
PM
+15V
D484
Q340
-12V
IC110
5 4
6 3
7 2
8 1
4.7K
51K
B C E
D485
.0056
.0056
D486
B C E
4.7K
51K
PL
GND
Q343
B C E
47K
47K
Q346
.0039
.0022
B C E
Q339
1M
4.7K
47K
47K
4.7K
220K
From Pt.
MA
B C E
Q342
47K
47K
3.3M
4.7K
.0018
.0018
From Pt.
D480
GND
MC
B C E
Q345
100K
+15V
360P
360P
3.3M
4.7K
.27
3.6K
62K
D483
-12V
.27
10K
D482
500P
39K
.068
1.5M
PF
1.5M
D478
47K
PE
PD
27K
+ 2 +
.0068
NU
22K
22K
GND
PC
D479
.12
22K
82K
D469
D468
D477
D466
PJ
.1
30P
+ 2 +
.0068
750 Ω
560K
D481
220K
.5
PG
GND
14 13 12 11 10 9 8
IC106
1 2 3 4 5 6 7
560K
.0068
.02
22K
220 Ω
GND
7 6 5 4 3 2 1
IC107
8 9 10 11 12 13 14
22K
.01
PH
560 Ω
+15V
100K
620K
2%
430K
15K
2%
.1
2 +
+
15K
D467
.039
NV
.0068
To Pt.
PK
D476
NZ
27K
.1
.039
TW
27K
D475
56K
.1
D47
PA
GND
PB

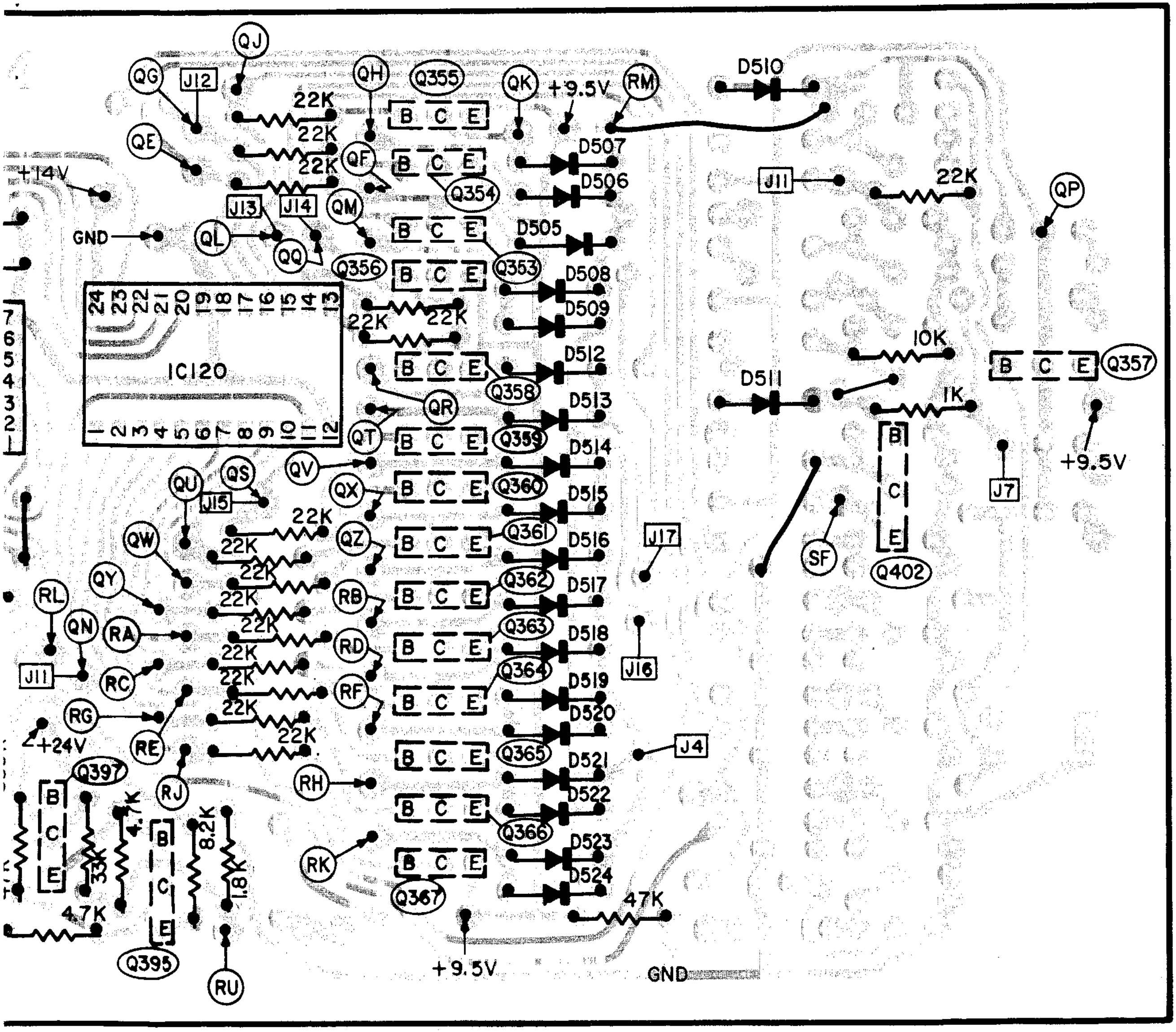
ENTATION


+13V
To Pt.
EH
Q310
3.9K
D393
68K
15K
2.2K
100K
15K
100K
1.8K
15K
Q347
E
E
E
4.7K
510K
910K
33K
D391
Q309
E
C
B
100K
.22
E
C
B
15M
.27
330K
.05
From Pt.
MB
From IC 103 Pin23
D394
To Pt
HD
22K
22K
From Pt.
HS
.05
120 Ω
R16
+18
-12V
4.7K
E
C
B
Q187
+
50
C14
NY
GND
+15V
-12V
C43
50
-13V
W
68 Ω
R50
D472
1
2%
240 Ω
82K
.033
2%
620 Ω
.068
.001
.0051
GND
22K
2%
680K
22K
56K
2%
62K
.068
3.9K
.0051
2%
390K
D473
2%
200 Ω
2%
300K
5 4 3 2 1
IC108
9 10 11 12 13 14
100K
.01
.005
.005
82K
GND
7 6 5 4 3 2 1
IC109
8 9 10 11 12 13 14
D471
200 Ω 2%
2%
300K
2%
360K
.033
.002
3.9K
.01
2%
300K
22K
D470
2%
62K
.033
2%
620 Ω
.01
22K
.05
2%
300 Ω
+15V
NX
GND

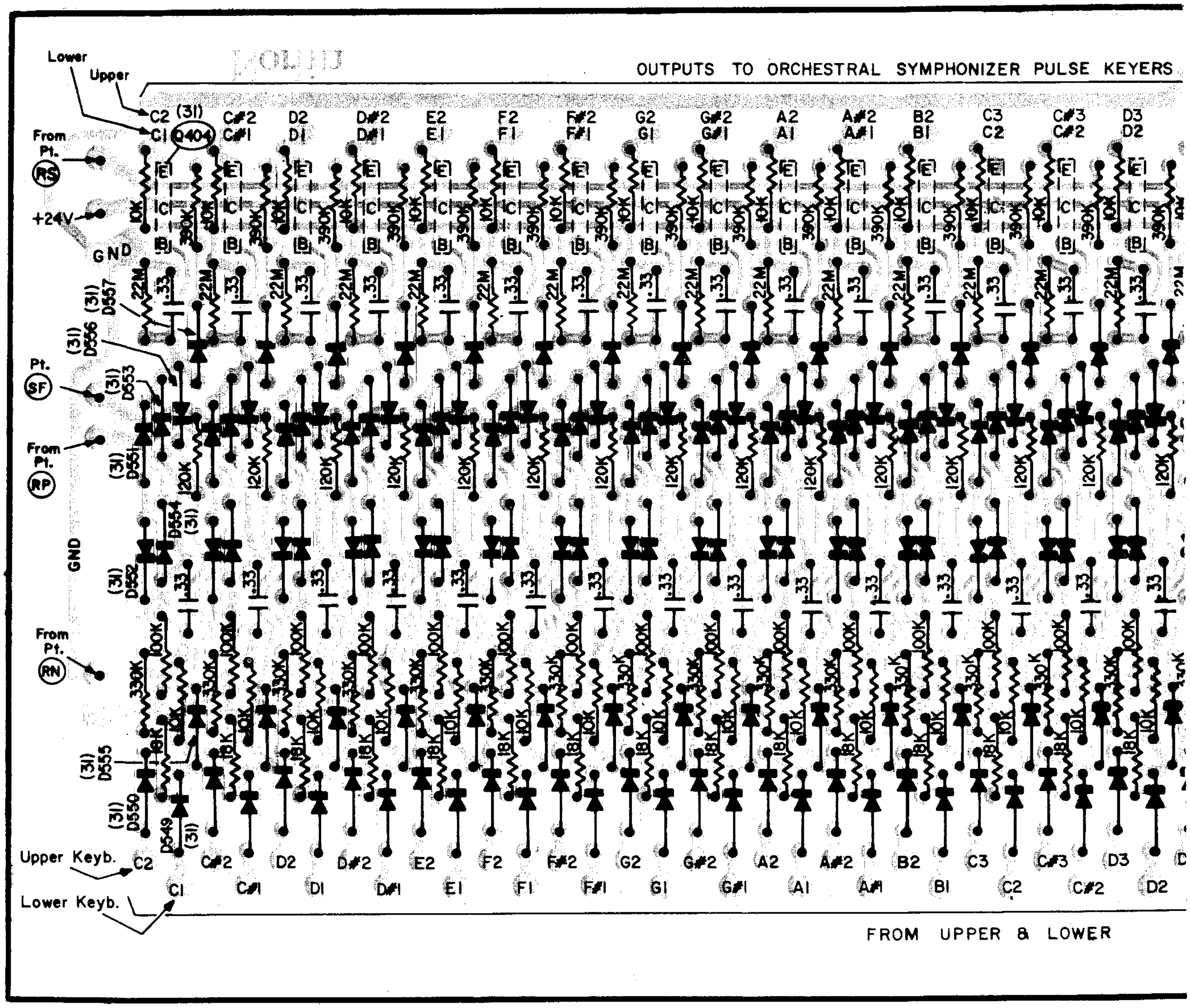

+24 V
RS
12K
GND
QB
22K
22K
+14V
D545
D547
1.5K
1.8K
QA
IC 114
PW
D496
D495
27Ω
R3
+13.9V
D546
RN
D494
Q398
D548
22K
22K
+14V
J6
D493
D491
C26
25
E C B
B C E
22K
33K
Q399
22K
PZ
D492
GND
GND
100K
33K
100K
100K
100K
GND
22K
PY
IC 116
IC 117
+14V
+14V
33K
33K
GND
QC
22K
PX
Q401
E C B
B C E
22K
GND
Q403
PV
To Pt.
F
10K
10K
PU
22K
IC 113
+14V
J7
SE
22K
D499
D500
+14V
D497
D498
J6
100K
RX
22K
From Pt.
RM
100K
22K
PN
J10
RP
33K
J4
PT
PS
22K
QD
IC 119
GND
IC 118
100K
22K
SD
22K
PR
E C B
Q400
J17
22K
PQ
+14V
22K
100K
GND
100K
100K
PP
+14V
2
+
RT
D543
GND
.1
Q390
E C B
RQ
Q389
Q392
+40V
GND
Q393
From Pt.
H
22K
47K
4.7M
47K
12K
B C E
10K
E C B
3.3K
33K
B C E
33K
22K
150K
100K
.033
E C B
100K
100K
D503
D501
220K
D542
D541
D504
D502
D544
Q391
100K
+
6
J16
220Ω
10K
Q394
J12
J13
J14
J15
From Low Voltage Keying Enable Line
RW
From Pt.
SG
080-025590-001

IZER LATCH BOARD

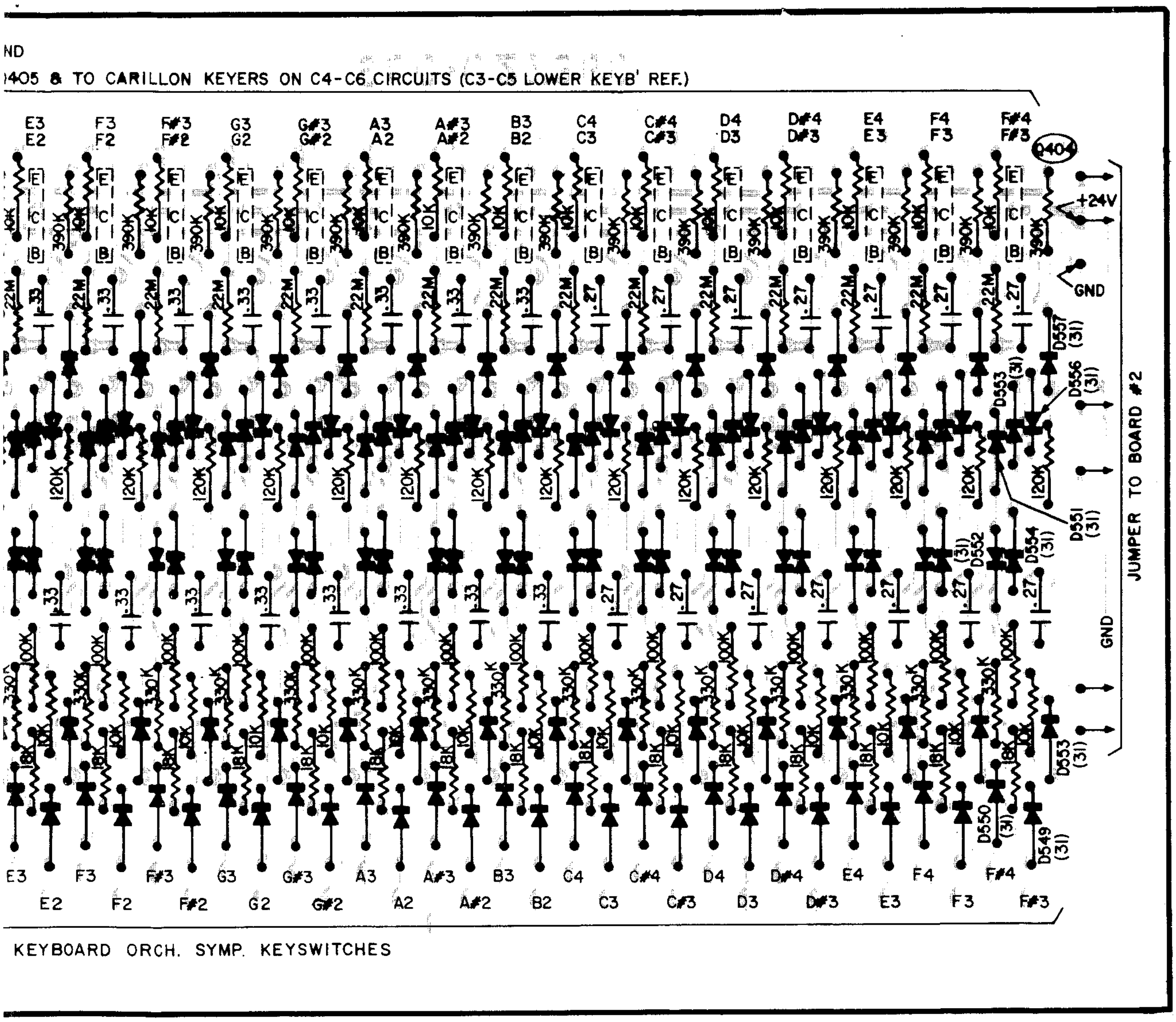
Like J No's Indicate On-Board Jumpers


QJ
QG
J12
QH
Q355
QK
+9.5V
RM
D510
22K
QE
22K
QF
D507
+14V
22K
Q354
D506
J11
22K
QP
J13
J14
QM
GND
QL
D505
QQ
Q356
Q353
D508
24 23 22 21 20 19 18 17 16 15 14 13
22K
22K
D509
10K
7
6
5
4
3
2
IC120
1 2 3 4 5 6 7 8 9 10 11 12
D512
Q358
Q357
D511
1K
QR
D513
QT
Q359
D514
+9.5V
QV
QU
QS
QX
J15
Q360
D515
J7
22K
22K
Q361
D516
J17
QW
QZ
22K
Q362
D517
SF
Q402
QY
22K
RL
RB
22K
Q363
D518
QN
RA
J16
22K
RD
22K
Q364
D519
J11
RC
RF
22K
D520
RG
22K
Q365
D521
J4
+24V
RE
Q397
RH
D522
RJ
4.7K
8.2K
1.8K
Q366
D523
33K
RK
D524
47K
Q367
4.7K
Q395
+9.5V
GND
RU
B C E

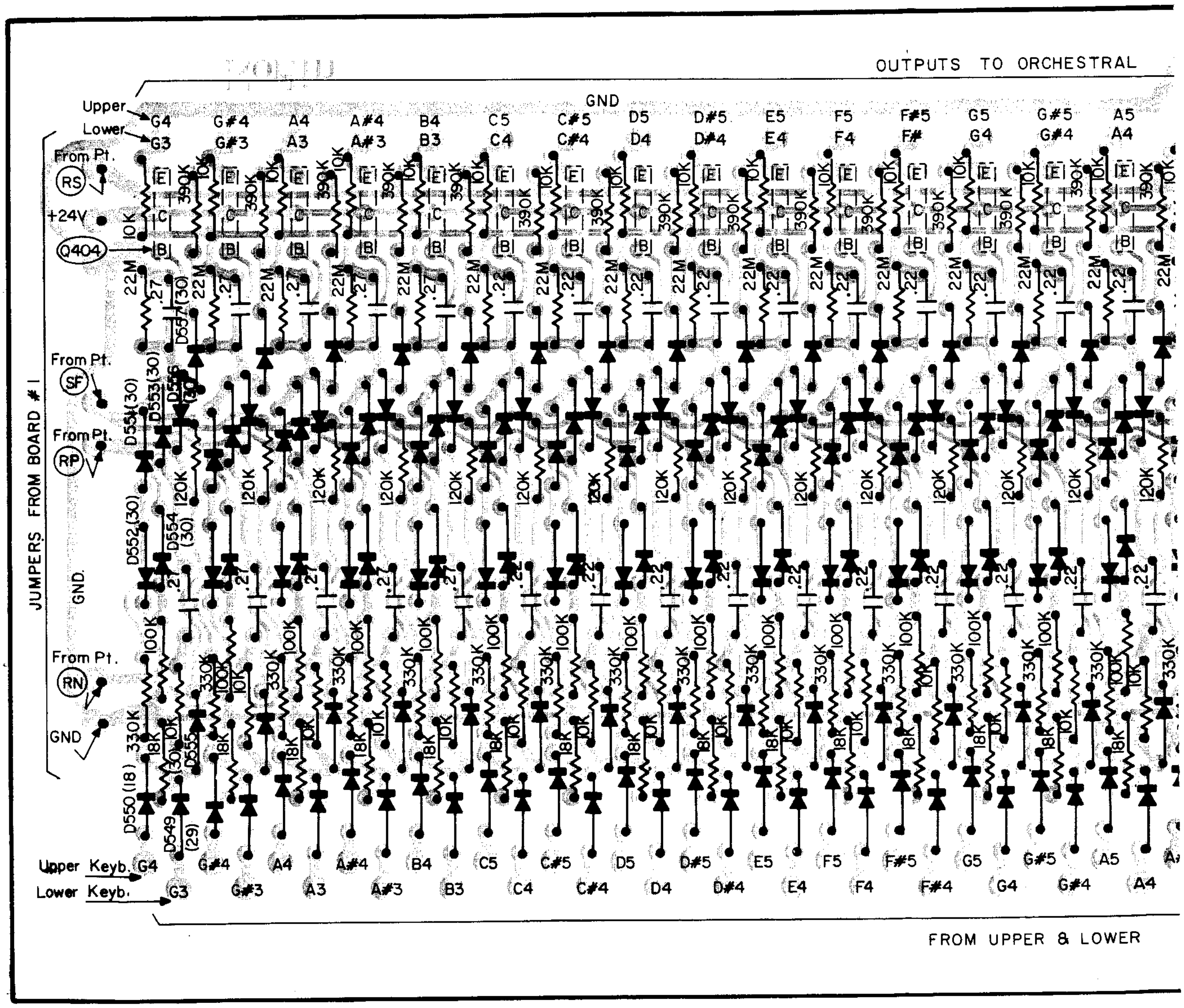
ORCHESTRAL SYMPHONIZER


OUTPUTS TO ORCHESTRAL SYMPHONIZER PULSE KEYERS
Lower
Upper
C2 (31) C#2 D2 D#2 E2 F2 F#2 G2 G#2 A2 A#2 B2 C3 C#3 D3
C1 Q404 C#1 D1 D#1 E1 F1 F#1 G1 G#1 A1 A#1 B1 C2 C#2 D2
From Pt. RS
+24V
GND
E
C
B
10K
390K
22M
.33
120K
100K
330K
18K
(31) D557
(31) D556
(31) D553
(31) D551
(31) D554
(31) D552
(31) D555
(31) D550
D549 (31)
Pt. SF
From Pt. RP
GND
From Pt. RN
Upper Keyb.
Lower Keyb.
C2 C#2 D2 D#2 E2 F2 F#2 G2 G#2 A2 A#2 B2 C3 C#3 D3
C1 C#1 D1 D#1 E1 F1 F#1 G1 G#1 A1 A#1 B1 C2 C#2 D2
FROM UPPER & LOWER

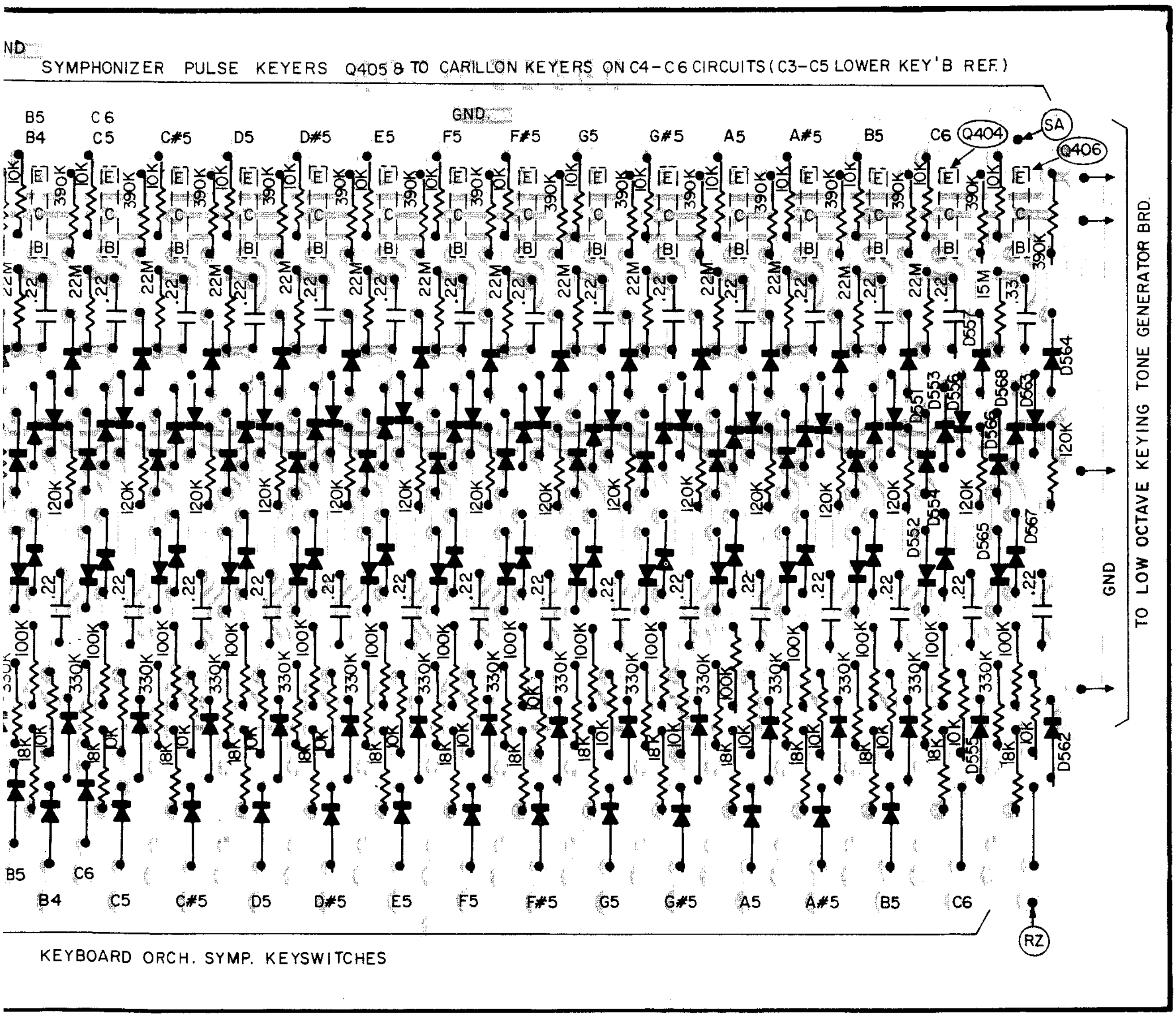
KEYING CONTROL BOARD 1

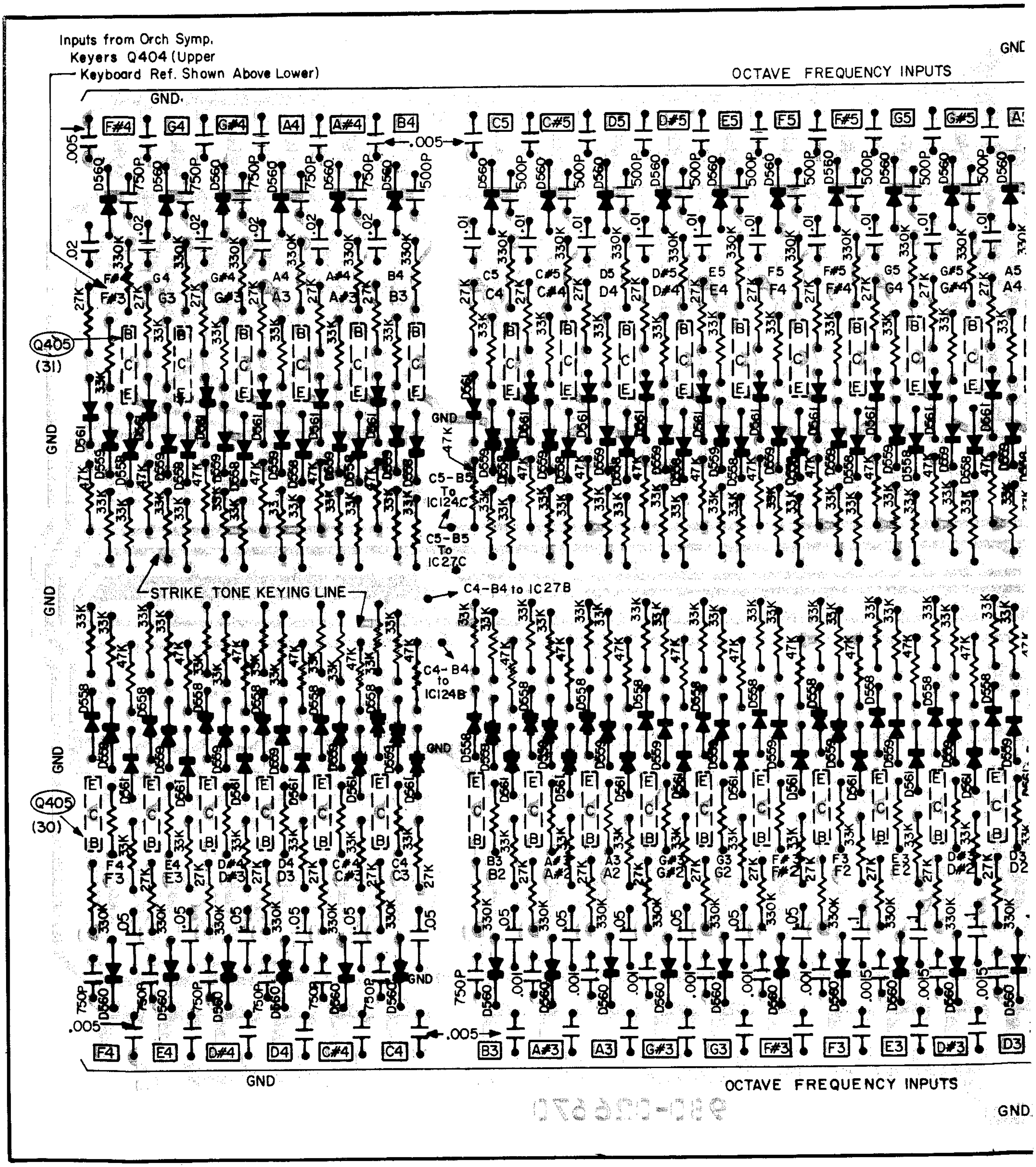

ND
1405 & TO CARILLON KEYERS ON C4-C6 CIRCUITS (C3-C5 LOWER KEYB' REF.)
E3 E2
F3 F2
F#3 F#2
G3 G2
G#3 G#2
A3 A2
A#3 A#2
B3 B2
C4 C3
C#4 C#3
D4 D3
D#4 D#3
E4 E3
F4 F3
F#4 F#3
Q404
E
C
B
10K
390K
22M
.33
.27
120K
100K
330K
18K
+24V
GND
D557 (31)
D556 (31)
D553 (31)
D551 (31)
D552 (31)
D554 (31)
D553 (31)
D550 (31)
D549 (31)
JUMPER TO BOARD #2
GND
E3
E2
F3
F2
F#3
F#2
G3
G2
G#3
G#2
A3
A2
A#3
A#2
B3
B2
C4
C3
C#4
C#3
D4
D3
D#4
D#3
E4
E3
F4
F3
F#4
F#3
KEYBOARD ORCH. SYMP. KEYSWITCHES

ORCHESTRAL SYMPHONIZER

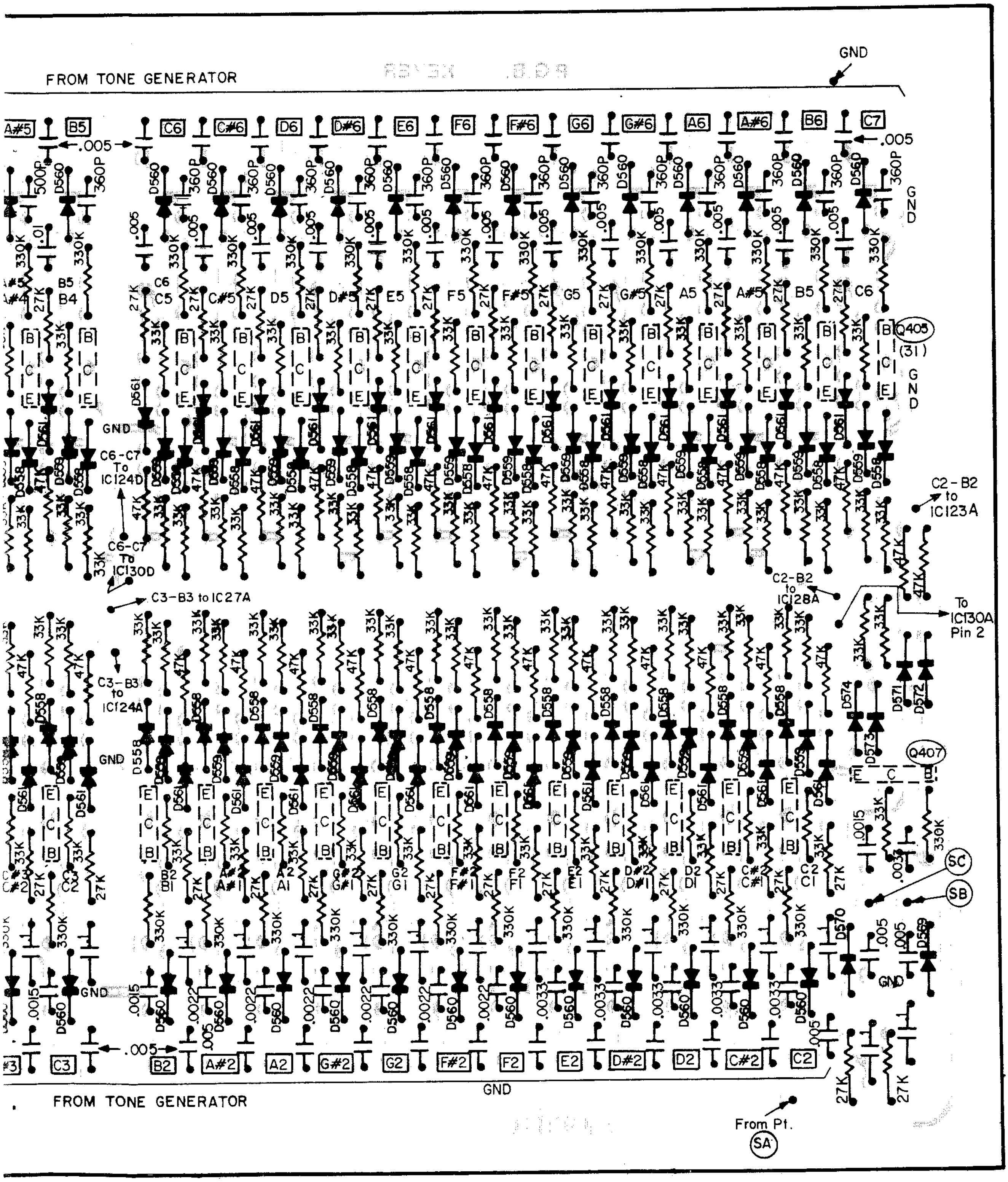

OUTPUTS TO ORCHESTRAL
GND
Upper
Lower
G4 G#4 A4 A#4 B4 C5 C#5 D5 D#5 E5 F5 F#5 G5 G#5 A5
G3 G#3 A3 A#3 B3 C4 C#4 D4 D#4 E4 F4 F# G4 G#4 A4
From Pt. RS
+24V
Q404
E
C
B
10K
390K
22M
.27
.22
D557(30)
D556(30)
D553(30)
D551(30)
From Pt. SF
From Pt. RP
120K
D552(30)
D554(30)
GND.
JUMPERS FROM BOARD #1
From Pt. RN
GND
100K
330K
18K
10K
D555(30)
D550(18)
D549(29)
Upper Keyb. G4 G#4 A4 A#4 B4 C5 C#5 D5 D#5 E5 F5 F#5 G5 G#5 A5
Lower Keyb. G3 G#3 A3 A#3 B3 C4 C#4 D4 D#4 E4 F4 F#4 G4 G#4 A4
FROM UPPER & LOWER

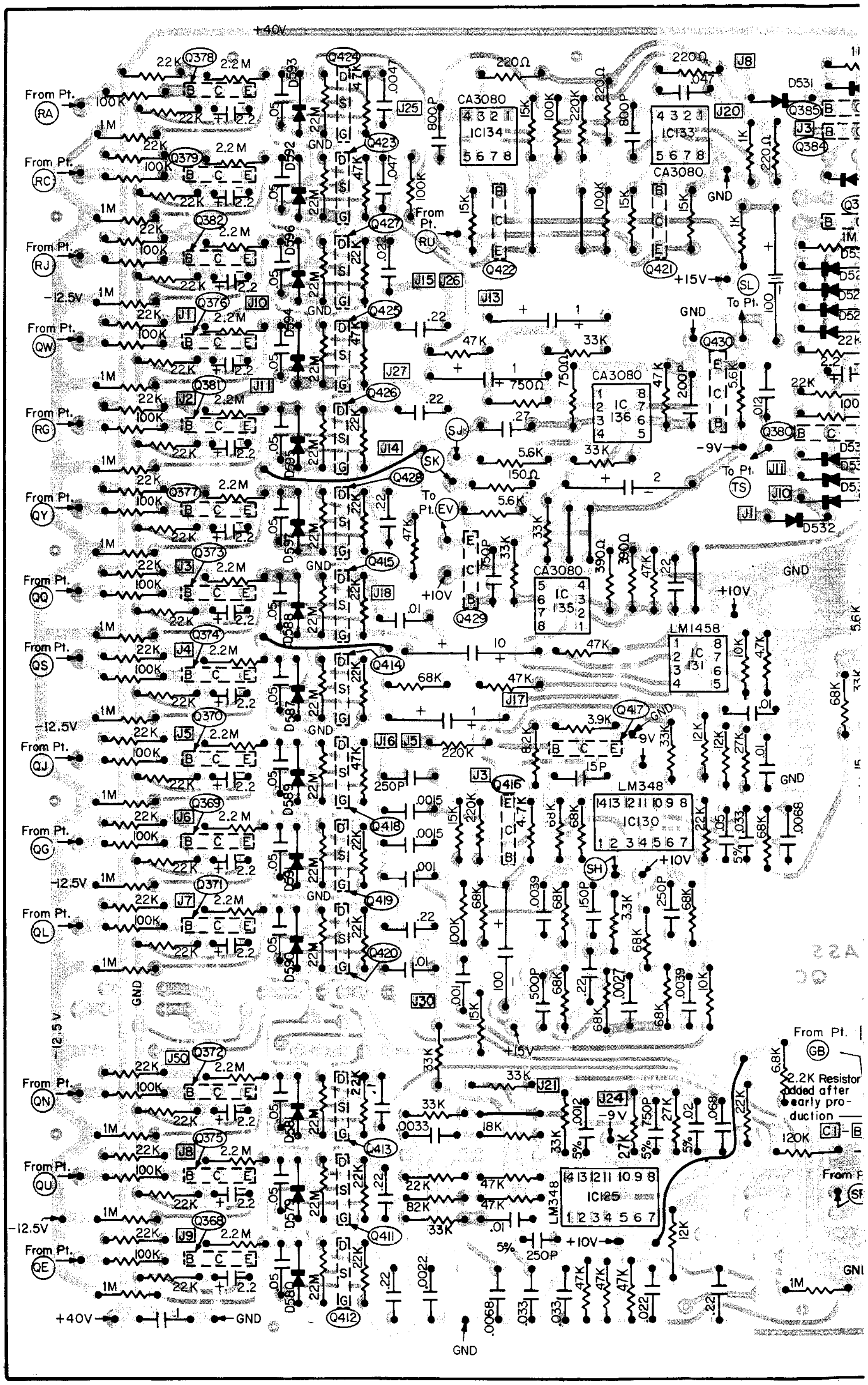
KEYING CONTROL BOARD 2


ND
SYMPHONIZER PULSE KEYERS Q405 & TO CARILLON KEYERS ON C4-C6 CIRCUITS (C3-C5 LOWER KEY'B REF.)
GND.
B5
C6
B4
C5
C#5
D5
D#5
E5
F5
F#5
G5
G#5
A5
A#5
B5
C6
Q404
SA
Q406
E
C
B
10K
390K
22M
.22
15M
.33
120K
100K
330K
18K
D551
D552
D553
D554
D555
D556
D557
D562
D563
D564
D565
D566
D567
D568
TO LOW OCTAVE KEYING TONE GENERATOR BRD.
GND
B5
C6
B4
C5
C#5
D5
D#5
E5
F5
F#5
G5
G#5
A5
A#5
B5
C6
RZ
KEYBOARD ORCH. SYMP. KEYSWITCHES

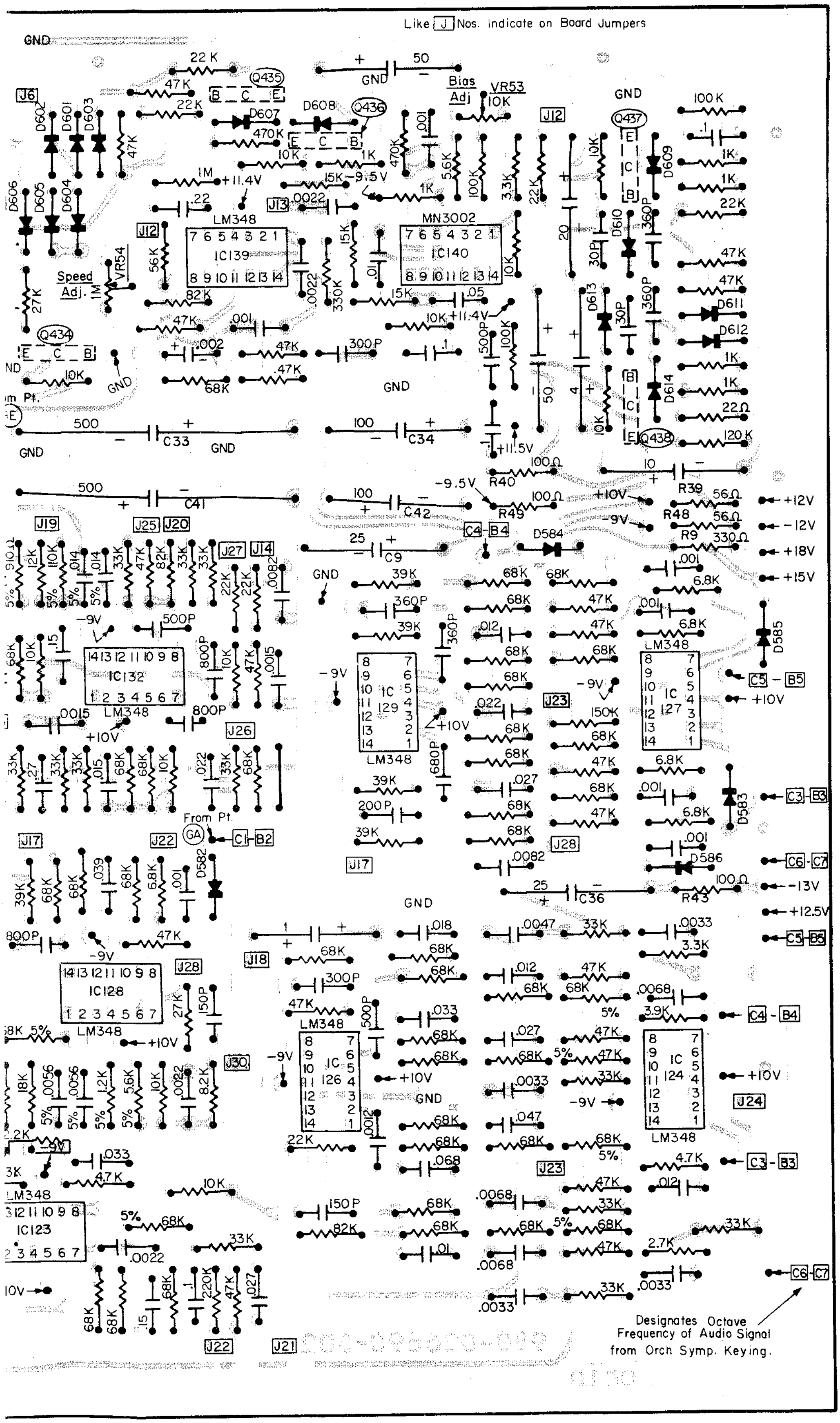

Inputs from Orch Symp. Keyers Q404 (Upper Keyboard Ref. Shown Above Lower)
GND
OCTAVE FREQUENCY INPUTS
F#4
G4
G#4
A4
A#4
B4
C5
C#5
D5
D#5
E5
F5
F#5
G5
G#5
.005
750P
500P
D560
D561
D558
D559
.02
.01
330K
27K
33K
47K
Q405 (31)
Q405 (30)
B
C
E
C5-B5 To IC124C
C5-B5 To IC27C
STRIKE TONE KEYING LINE
C4-B4 to IC27B
C4-B4 to IC124B
F4
E4
D#4
D4
C#4
C4
B3
A#3
A3
G#3
G3
F#3
F3
E3
D#3
D3
.05
.001
.0015
GND
OCTAVE FREQUENCY INPUTS
GND

KEYER BOARD


FROM TONE GENERATOR
GND
A#5
B5
C6
C#6
D6
D#6
E6
F6
F#6
G6
G#6
A6
A#6
B6
C7
.005
500P
360P
D560
.01
330K
27K
33K
47K
B5
B4
C6
C5
C#5
D5
D#5
E5
F5
F#5
G5
G#5
A5
A#5
B5
C6
B
C
E
Q405
(31)
GND
D561
D559
D558
C6-C7 To IC124D
C6-C7 To IC130D
C3-B3 to IC27A
C3-B3 to IC124A
C2-B2 to IC123A
C2-B2 to IC128A
To IC130A Pin 2
D574
D571
D572
D573
Q407
.0015
.003
SC
SB
D570
D569
C#2
C2
B2
B1
A#1
A2
A1
G#2
G#1
G2
G1
F#2
F#1
F2
F1
E2
E1
D#2
D#1
D2
D1
C#1
C1
.0022
.0033
C3
A#2
G#2
G2
F#2
F2
E2
D#2
D2
C#2
#3
From Pt. SA


+40V
From Pt. RA
From Pt. RC
From Pt. RJ
From Pt. QW
From Pt. RG
From Pt. QY
From Pt. QQ
From Pt. QS
From Pt. QJ
From Pt. QG
From Pt. QL
From Pt. QN
From Pt. QU
From Pt. QE
-12.5V
Q378
Q379
Q382
Q376
Q381
Q377
Q373
Q374
Q370
Q369
Q371
Q372
Q375
Q368
Q424
Q423
Q427
Q425
Q426
Q428
Q415
Q414
Q418
Q419
Q420
Q413
Q411
Q412
Q422
Q421
Q430
Q429
Q417
Q416
Q385
Q384
Q380
CA3080
IC134
IC133
IC136
IC135
LM1458
IC131
LM348
IC130
IC125
From Pt. RU
To Pt. SL
To Pt. TS
To Pt. EV
SJ
SK
SH
+15V
-9V
+10V
GND
D531
D532
J8
J20
J25
J27
J14
J18
J17
J16
J5
J3
J30
J21
J24
J50
From Pt. GB
2.2K Resistor added after early production
120K
From Pt. SF
1M

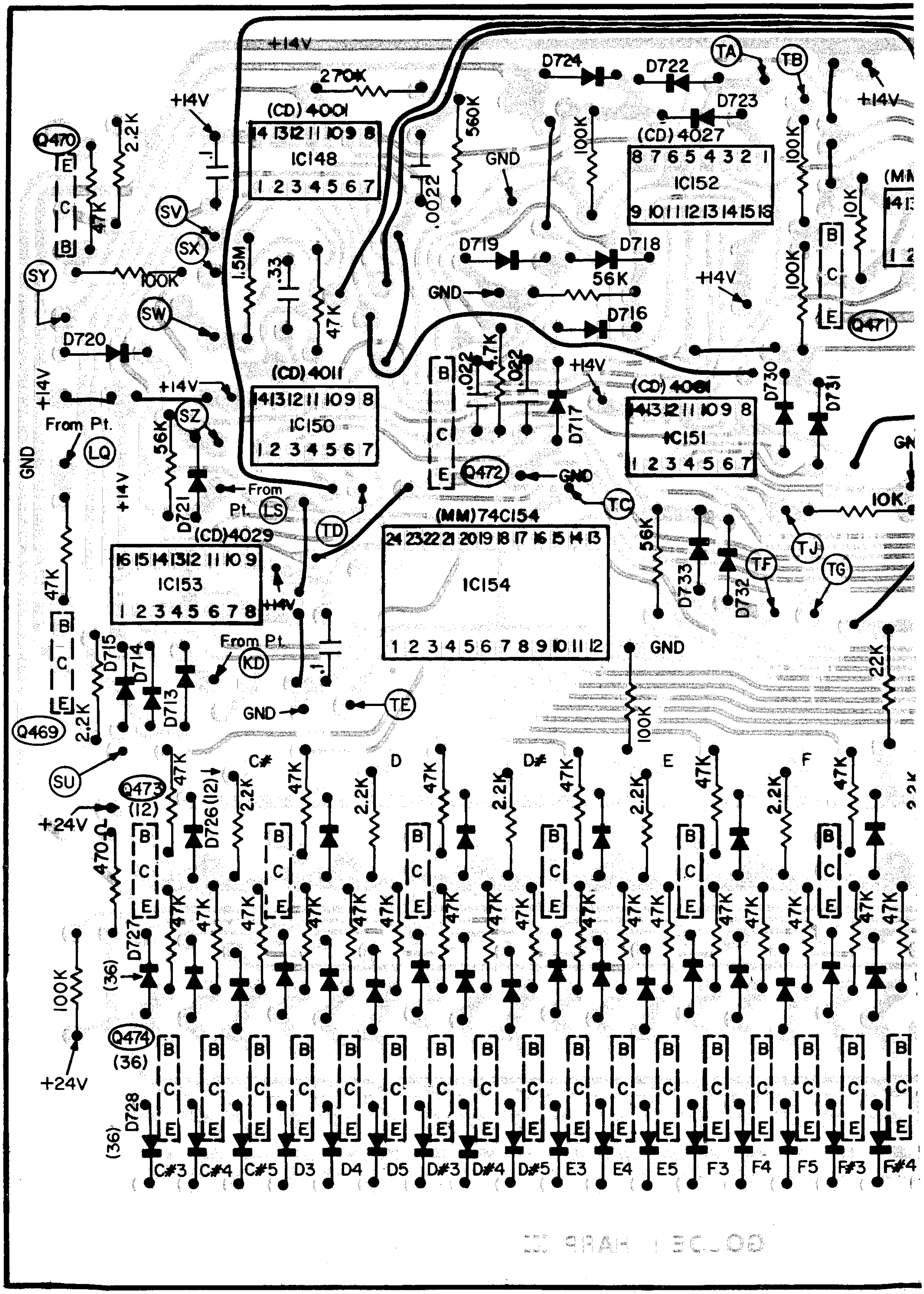
QUALITY CONTROL BOARD



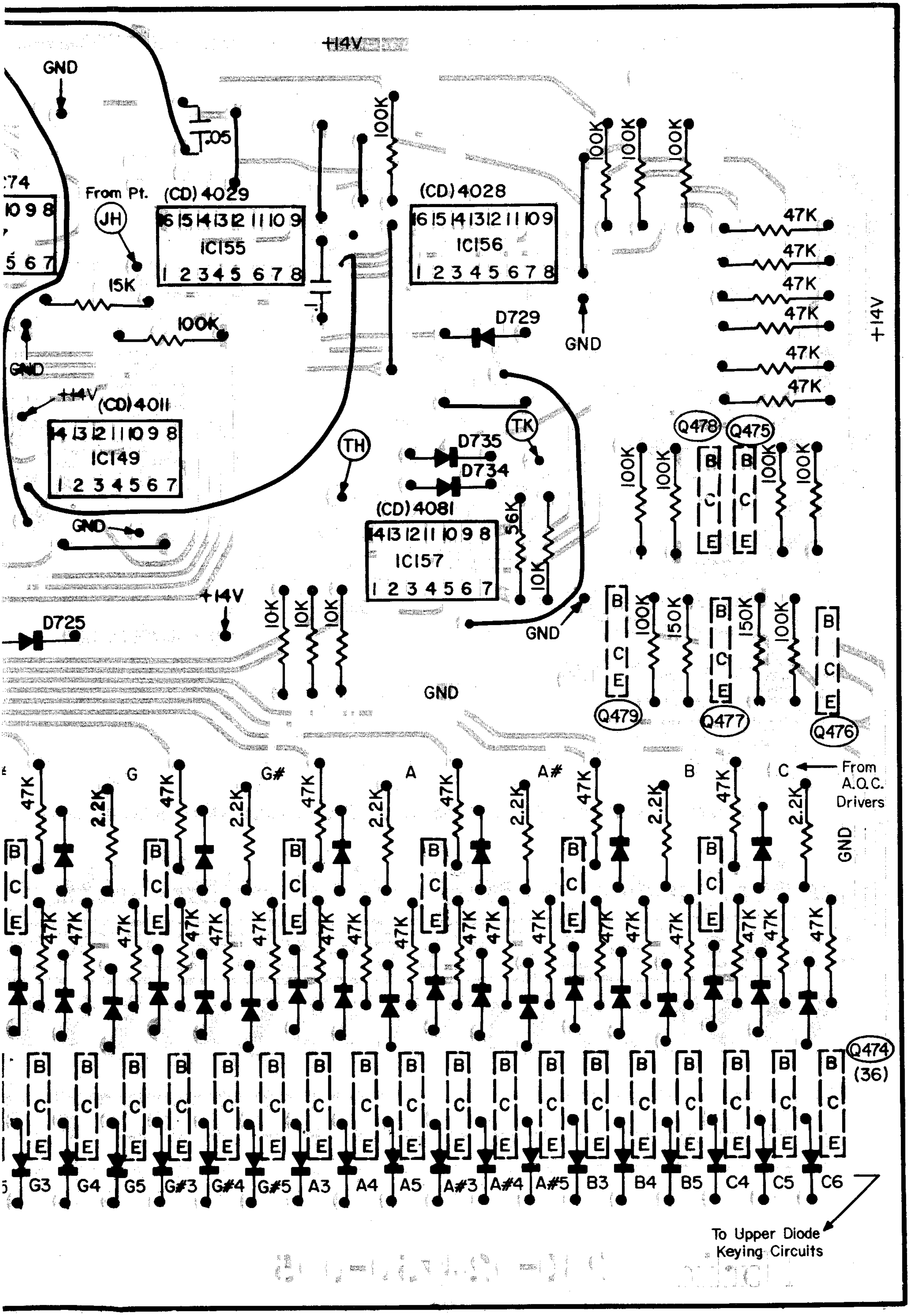
Like J Nos. indicate on Board Jumpers

Designates Octave Frequency of Audio Signal from Orch Symp. Keying.

GND
Q434
Q435
Q436
Q437
Q438
D601
D602
D603
D604
D605
D606
D607
D608
D609
D610
D611
D612
D613
D614
D582
D583
D584
D585
D586
LM348
IC139
MN3002
IC140
IC132
IC129
IC127
IC128
IC126
IC124
IC123
Speed Adj.
VR54
Bias Adj
VR53
C33
C34
C41
C42
C9
C36
R39
R40
R43
R48
R49
R9
+11.4V
-9.5V
+11.5V
+10V
-9V
+12V
-12V
+18V
+15V
-13V
+12.5V
C5-B5
C3-B3
C6-C7
C4-B4
C1-B2
From Pt. GA
J6
J12
J13
J14
J17
J18
J19
J20
J21
J22
J23
J24
J25
J26
J27
J28
J30

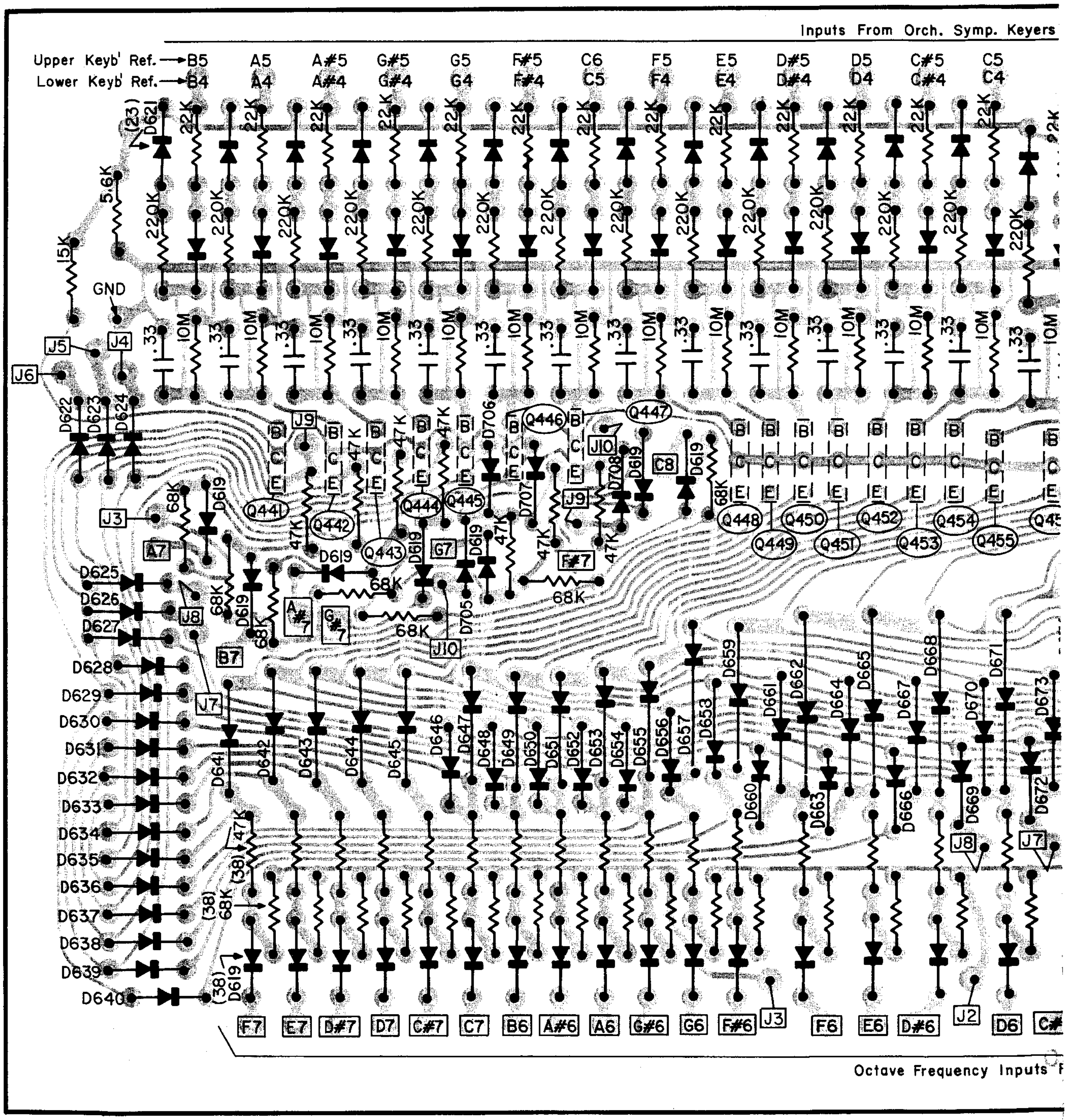

+14V
270K
(CD) 4001
IC148
14 13 12 11 10 9 8
1 2 3 4 5 6 7
.0022
560K
GND
D724
D722
TA
TB
D723
100K
(CD) 4027
IC152
8 7 6 5 4 3 2 1
9 10 11 12 13 14 15 16
10K
Q470
E
C
B
47K
2.2K
.1
SV
SX
SY
100K
1.5M
.33
47K
SW
D720
D719
D718
GND
56K
D716
+14V
Q471
(CD) 4011
IC150
14 13 12 11 10 9 8
1 2 3 4 5 6 7
.022
4.7K
D717
(CD) 4081
IC151
D730
D731
Q472
GND
TC
From Pt.
LQ
SZ
56K
D721
From Pt. LS
TD
(CD)4029
IC153
16 15 14 13 12 11 10 9
1 2 3 4 5 6 7 8
(MM)74C154
IC154
24 23 22 21 20 19 18 17 16 15 14 13
1 2 3 4 5 6 7 8 9 10 11 12
56K
D733
D732
TF
TJ
TG
10K
GND
22K
From Pt. KD
D715
D714
D713
Q469
2.2K
GND
TE
100K
SU
Q473
(12)
D726(12)
+24V
470
C#
D
D#
E
F
D727
(36)
Q474
(36)
D728
(36)
+24V
C#3
C#4
C#5
D3
D4
D5
D#3
D#4
D#5
E3
E4
E5
F3
F4
F5
F#3
F#4

BOARD



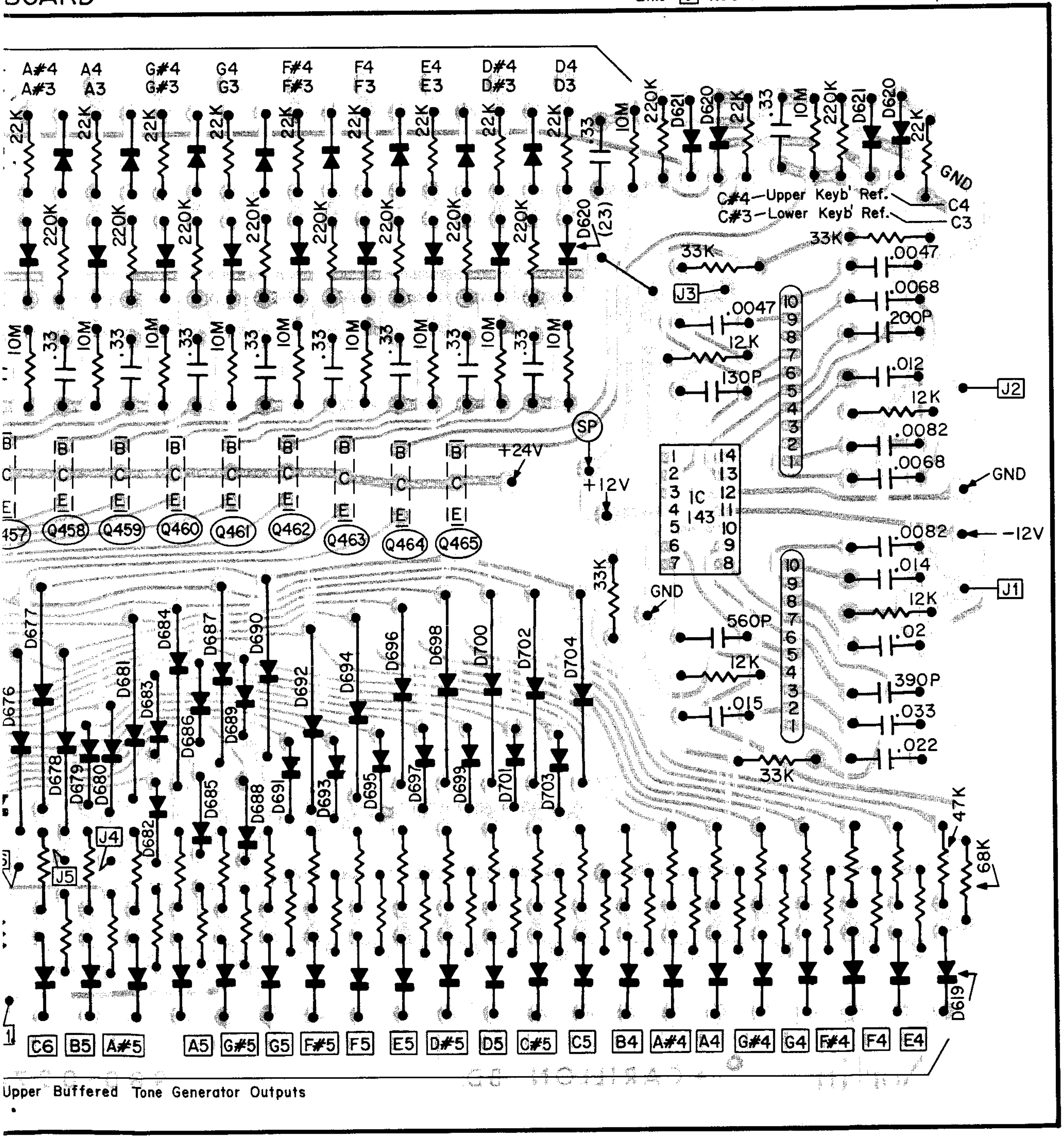
+14V
GND
.05
100K
(CD) 4029
IC155
16 15 14 13 12 11 10 9
1 2 3 4 5 6 7 8
(CD) 4028
IC156
16 15 14 13 12 11 10 9
1 2 3 4 5 6 7 8
From Pt.
JH
15K
100K
D729
GND
47K
47K
47K
47K
47K
47K
+14V
GND
+14V
(CD) 4011
IC149
14 13 12 11 10 9 8
1 2 3 4 5 6 7
TH
TK
D735
D734
Q478
Q475
B
C
E
100K
100K
100K
100K
(CD) 4081
IC157
14 13 12 11 10 9 8
1 2 3 4 5 6 7
56K
10K
GND
+14V
D725
10K
10K
10K
GND
100K
150K
150K
100K
Q479
Q477
Q476
G
G#
A
A#
B
C
From A.O.C. Drivers
GND
47K
2.2K
Q474
(36)
G3
G4
G5
G#3
G#4
G#5
A3
A4
A5
A#3
A#4
A#5
B3
B4
B5
C4
C5
C6
To Upper Diode Keying Circuits

CARILLON


Inputs From Orch. Symp. Keyers
Upper Keyb' Ref.
Lower Keyb' Ref.
B5
B4
A5
A4
A#5
A#4
G#5
G#4
G5
G4
F#5
F#4
C6
C5
F5
F4
E5
E4
D#5
D#4
D5
D4
C#5
C#4
C5
C4
(23)
D621
22K
220K
5.6K
15K
GND
.33
10M
J4
J5
J6
J3
J7
J8
J9
J10
D622
D623
D624
D619
68K
47K
B
C
E
Q441
Q442
Q443
Q444
Q445
Q446
Q447
Q448
Q449
Q450
Q451
Q452
Q453
Q454
Q455
D705
D706
D707
D708
A7
G7
F#7
C8
B7
A#7
G#7
D625
D626
D627
D628
D629
D630
D631
D632
D633
D634
D635
D636
D637
D638
D639
D640
D641
D642
D643
D644
D645
D646
D647
D648
D649
D650
D651
D652
D653
D654
D655
D656
D657
D658
D659
D660
D661
D662
D663
D664
D665
D666
D667
D668
D669
D670
D671
D672
D673
(38)
J2
F7
E7
D#7
D7
C#7
C7
B6
A#6
A6
G#6
G6
F#6
F6
E6
D#6
D6
C#
Octave Frequency Inputs F

BOARD

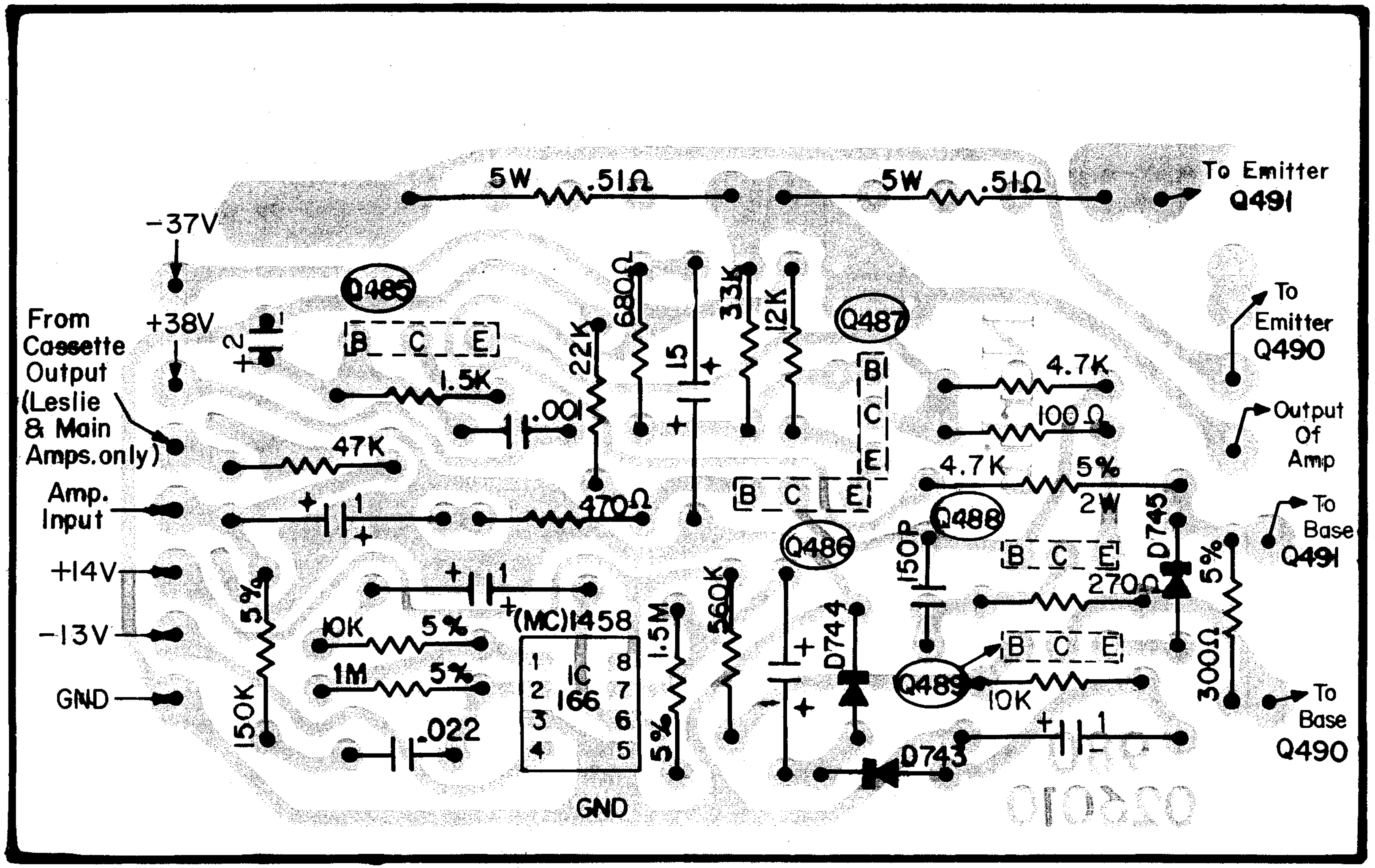
Like [J] No's Indicate On-Board Jumpers


A#4 A#3
A4 A3
G#4 G#3
G4 G3
F#4 F#3
F4 F3
E4 E3
D#4 D#3
D4 D3
22K
220K
10M
.33
D620
D621
D620 (23)
GND
C#4—Upper Keyb' Ref.
C#3—Lower Keyb' Ref.
C4
C3
33K
.0047
.0068
200P
.012
12K
.0082
J3
J2
J1
130P
SP
+24V
+12V
-12V
B
C
E
Q457
Q458
Q459
Q460
Q461
Q462
Q463
Q464
Q465
IC 143
.014
.02
560P
390P
.015
.033
.022
47K
68K
D619
D676
D677
D678
D679
D680
D681
D682
D683
D684
D685
D686
D687
D688
D689
D690
D691
D692
D693
D694
D695
D696
D697
D698
D699
D700
D701
D702
D703
D704
J4
J5
C6
B5
A#5
A5
G#5
G5
F#5
F5
E5
D#5
D5
C#5
C5
B4
A#4
A4
G#4
G4
F#4
F4
E4

Upper Buffered Tone Generator Outputs

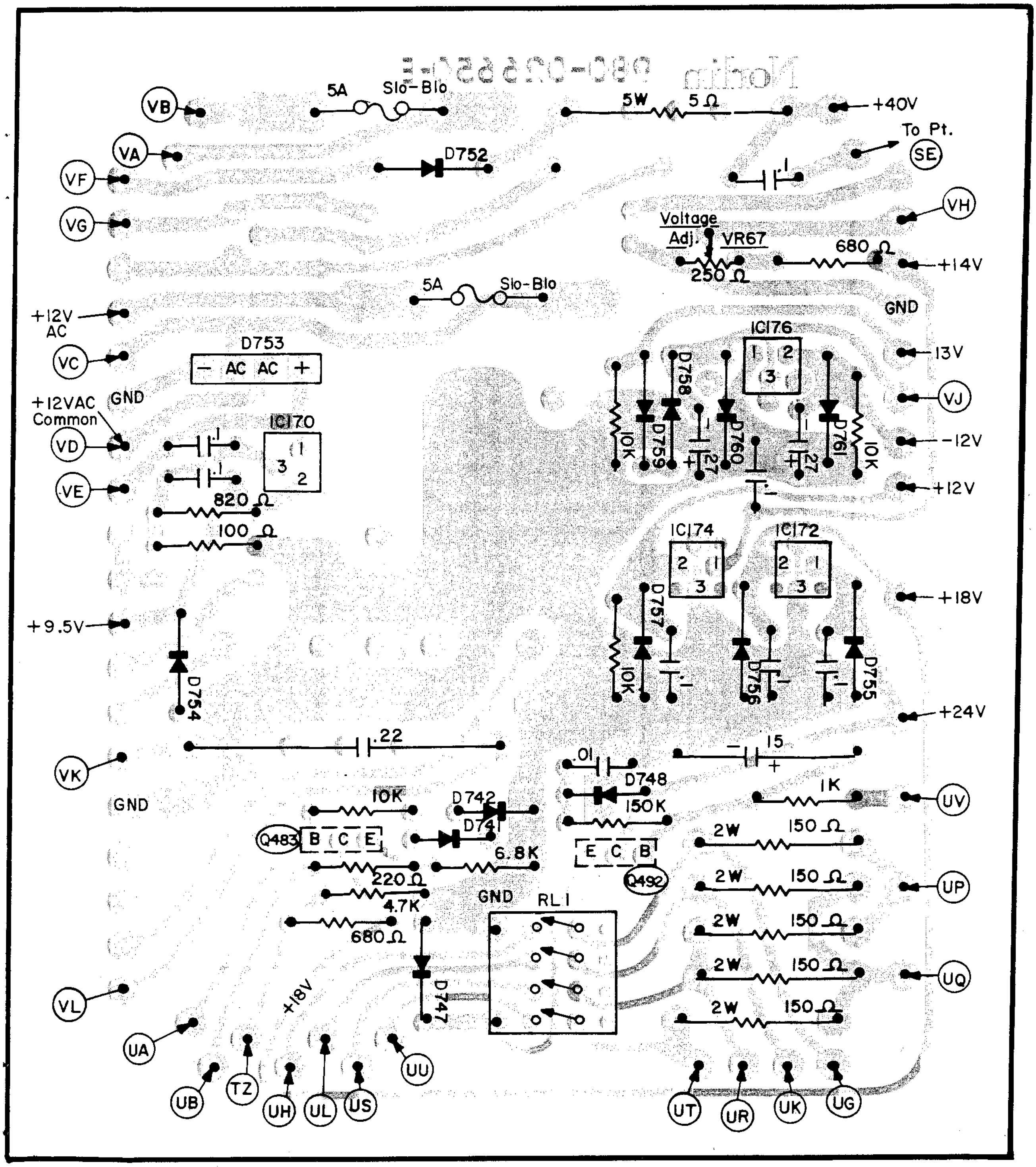
AMPLIFIER BOARD

(1 Of 4 Typical Amps)

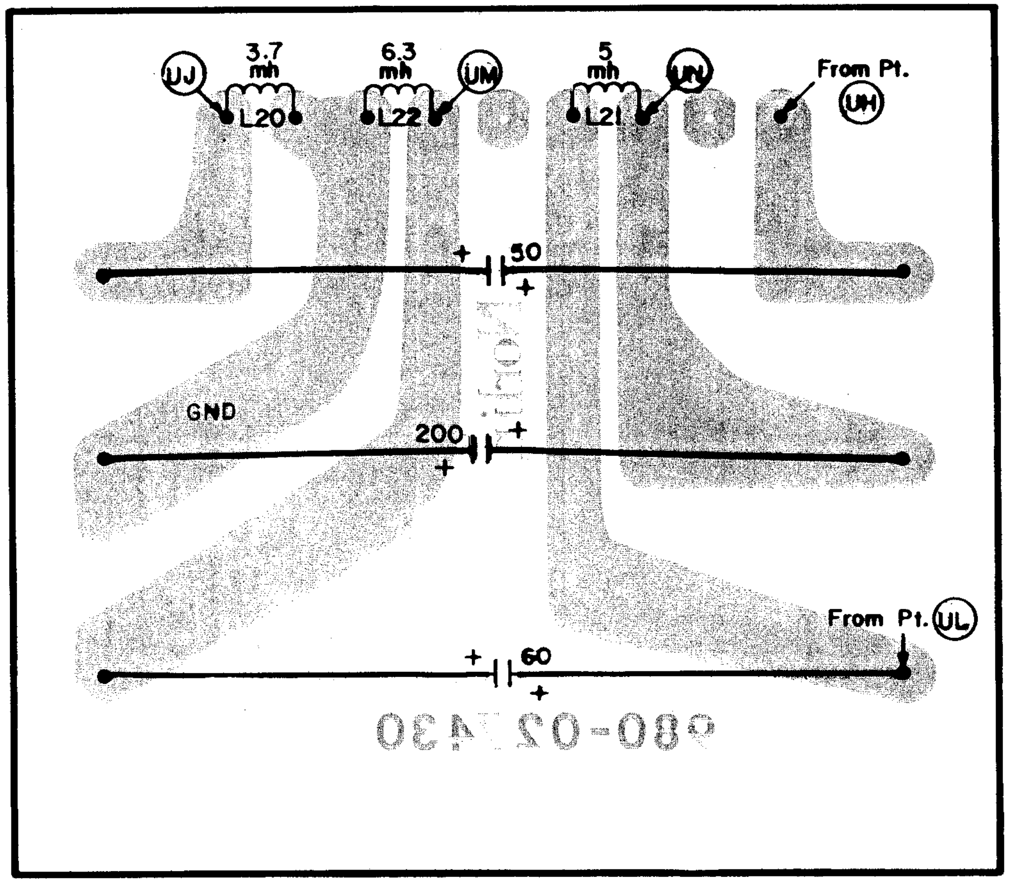


5W .51Ω
5W .51Ω
To Emitter Q491
-37V
+38V
From Cassette Output (Leslie & Main Amps.only)
Amp. Input
+14V
-13V
GND
Q485
B C E
2 +
1.5K
47K
+ 1 +
22K
680Ω
.001
15 +
33K
12K
Q487
B C E
B C E
Q486
470Ω
4.7K
100Ω
4.7K 5%
2W
To Emitter Q490
Output Of Amp
To Base Q491
To Base Q490
Q488
150P
B C E
270Ω
D745
5%
300Ω
Q489
B C E
10K
+ 1 -
D744
D743
+ +
560K
1.5M 5%
(MC)1458
IC 166
1 2 3 4 8 7 6 5
GND
+ 1 +
10K 5%
1M 5%
.022
150K 5%

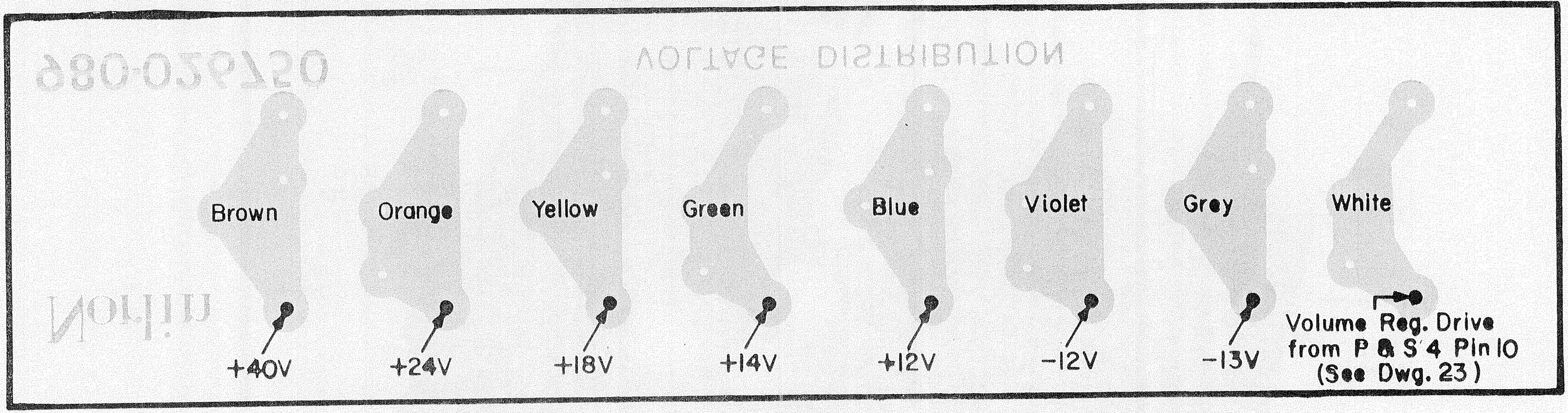
POWER SUPPLY BD.


VB
5A
Slo-Blo
5W
5 Ω
+40V
To Pt.
SE
VA
D752
VF
.1
VG
VH
Voltage Adj.
VR67
680 Ω
250 Ω
+14V
5A
Slo-Blo
+12V AC
GND
D753
− AC AC +
IC176
1 2 3
VC
13V
D758
+12VAC Common
GND
VJ
IC170
1 3 2
VD
10K
D759
27
D760
27
D761
10K
−12V
.1
.1
VE
820 Ω
+12V
100 Ω
IC174
2 1 3
IC172
2 1 3
D757
+18V
+9.5V
10K
.1
D756
.1
.1
D755
D754
+24V
22
15
VK
.01
D748
1K
UV
GND
10K
D742
150K
D741
2W
150 Ω
Q483
B C E
6.8K
E C B
220 Ω
Q492
2W
150 Ω
UP
4.7K
GND
RL1
680 Ω
2W
150 Ω
2W
150 Ω
UQ
+18V
D747
2W
150 Ω
VL
UA
UU
UB
TZ
UH
UL
US
UT
UR
UK
UG

CROSSOVER BOARD

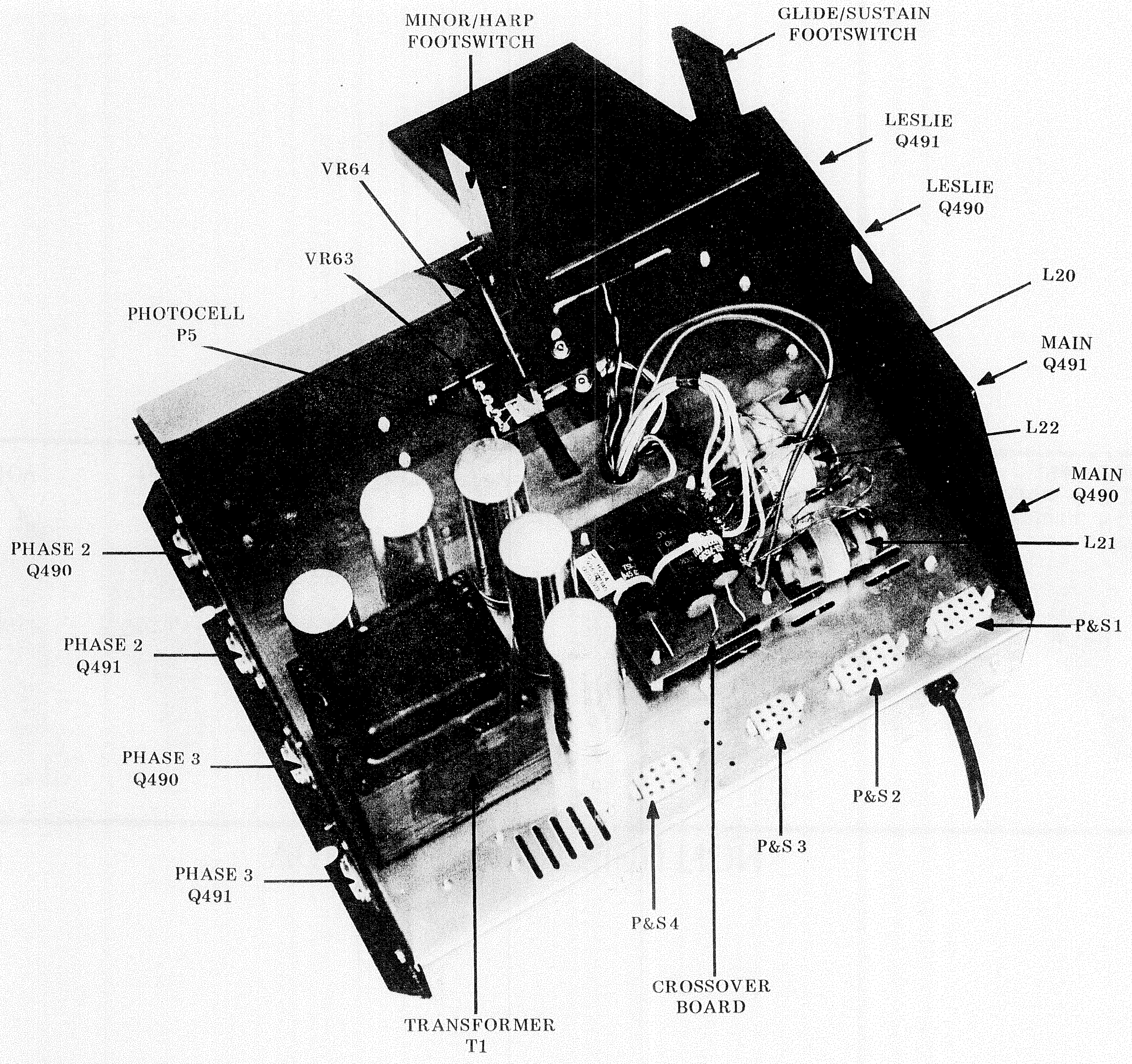

UJ
3.7
mh
L20
6.3
mh
L22
UM
5
mh
L21
UN
From Pt.
UH
50
+
+
GND
200
+
+
From Pt.
UL
60
+
+

VOLTAGE DISTRIBUTION

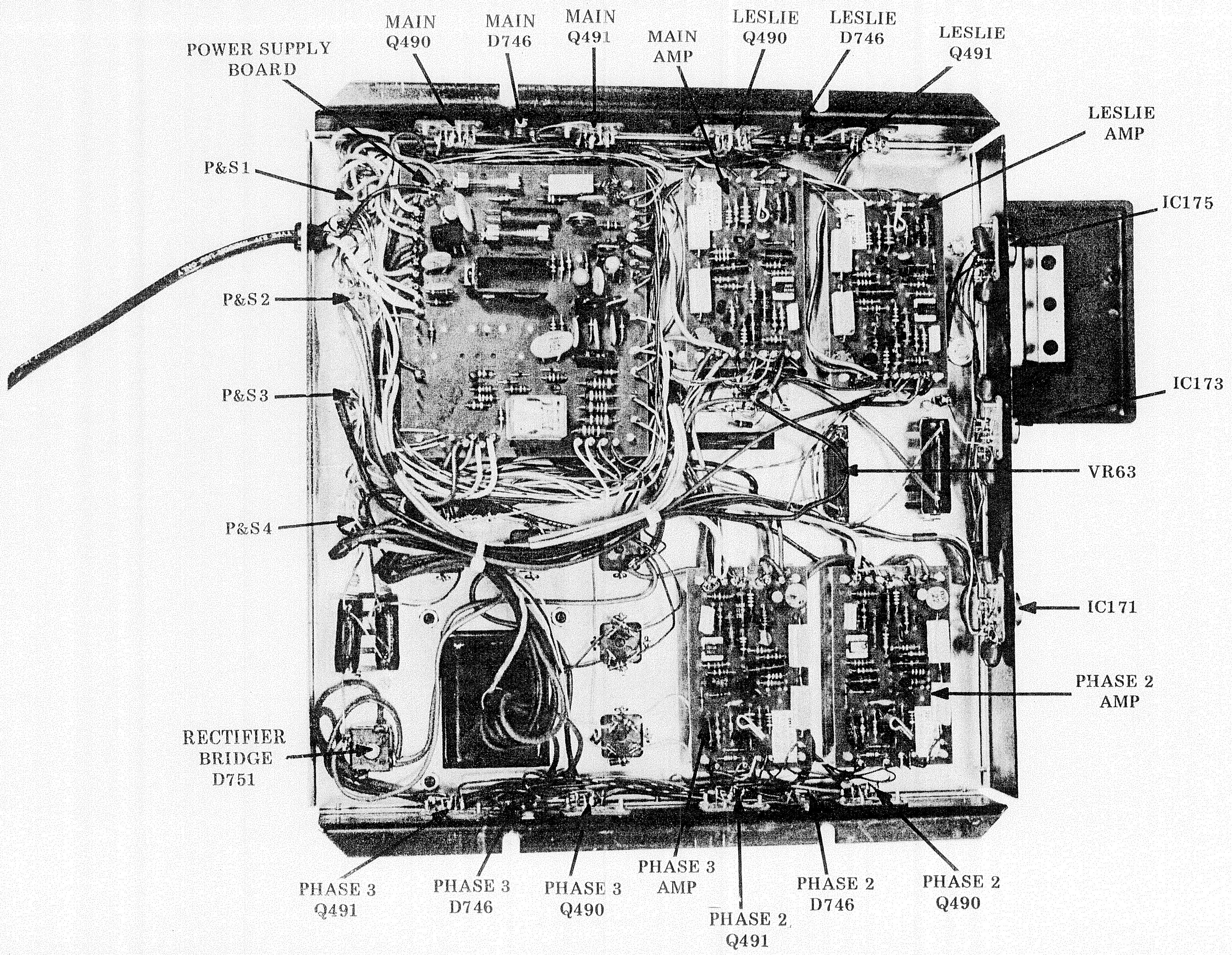

Brown
+40V
Orange
+24V
Yellow
+18V
Green
+14V
Blue
+12V
Violet
−12V
Grey
−13V
White
Volume Reg. Drive
from P & S 4 Pin 10
(See Dwg. 23)

AMPLIFIER/POWER SUPPLY & EXPRESSION PEDAL ASSEMBLY

(Top View)


MINOR/HARP FOOTSWITCH
GLIDE/SUSTAIN FOOTSWITCH
LESLIE Q491
LESLIE Q490
VR64
VR63
L20
PHOTOCELL P5
MAIN Q491
L22
MAIN Q490
L21
PHASE 2 Q490
PHASE 2 Q491
P&S1
P&S2
PHASE 3 Q490
P&S 3
PHASE 3 Q491
P&S4
CROSSOVER BOARD
TRANSFORMER T1

AMPLIFIER/POWER SUPPLY & EXPRESSION PEDAL ASSEMBLY
(Bottom View)


POWER SUPPLY BOARD
MAIN Q490
MAIN D746
MAIN Q491
MAIN AMP
LESLIE Q490
LESLIE D746
LESLIE Q491
LESLIE AMP
IC175
IC173
VR63
IC171
PHASE 2 AMP
P&S1
P&S2
P&S3
P&S4
RECTIFIER BRIDGE D751
PHASE 3 Q491
PHASE 3 D746
PHASE 3 Q490
PHASE 3 AMP
PHASE 2 Q491
PHASE 2 D746
PHASE 2 Q490